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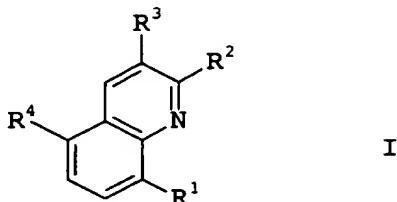
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Cyclohexenonequinolinoyl derivatives

5 The present invention relates to novel cyclohexenonequinolinoyl derivatives of the formula I,

10



15

where:

20 R¹ is hydrogen, nitro, halogen, cyano, C₁-C₆-alkyl, C₁-C₆-haloalkyl, C₁-C₆-alkoxyiminomethyl,

25 C₁-C₆-alkoxy, C₁-C₆-haloalkoxy, C₁-C₆-alkylthio, C₁-C₆-haloalkylthio, C₁-C₆-alkylsulfinyl,

30 C₁-C₆-haloalkylsulfinyl, C₁-C₆-alkylsulfonyl, C₁-C₆-haloalkylsulfonyl, aminosulfonyl, N-(C₁-C₆-alkyl)aminosulfonyl,

35 N,N-di-(C₁-C₆-alkyl)aminosulfonyl, N-(C₁-C₆-alkylsulfonyl)amino, N-(C₁-C₆-haloalkylsulfonyl)amino,

40 N-(C₁-C₆-alkyl)-N-(C₁-C₆-alkylsulfonyl)amino, N-(C₁-C₆-alkyl)-N-(C₁-C₆-haloalkylsulfonyl)amino, phenoxy, heterocyclxy, phenylthio or heterocyclthio, where the four last-mentioned

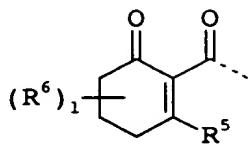
45 radicals may be partially or fully halogenated and/or may carry one to three of the following substituents: nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

50 R², R³ are hydrogen, C₁-C₆-alkyl, C₁-C₆-haloalkyl or halogen;

55

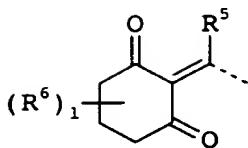
R⁴ is a compound IIa or IIb

45



5

IIa



IIb

where

10

R^5 is halogen, OR^7 , SR^7 , SOR^8 , SO_2R^8 , OSO_2R^8 , POR^8R^9 , OPR^8R^9 , $OPOR^8R^9$, $OPSR^8R^9$, $NR^{10}R^{11}$, $ONR^{11}R^{12}$, N-linked heterocyclyl or O-(N-linked heterocyclyl), where the heterocyclyl radical of the two last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

nitro, cyano, C_1-C_4 -alkyl, C_1-C_4 -haloalkyl, C_1-C_4 -alkoxy or C_1-C_4 -haloalkoxy;

20

R^6 is nitro, halogen, cyano, C_1-C_6 -alkyl, C_1-C_6 -haloalkyl, di-(C_1-C_6 -alkoxy)methyl, di-(C_1-C_6 -alkylthio)methyl, (C_1-C_6 -alkoxy)(C_1-C_6 -alkylthio)methyl, hydroxy, C_1-C_6 -alkoxy, C_1-C_6 -haloalkoxy, C_1-C_6 -alkoxycarbonyloxy, C_1-C_6 -alkylthio, C_1-C_6 -alkylsulfinyl, C_1-C_6 -haloalkylsulfinyl, C_1-C_6 -alkylsulfonyl, C_1-C_6 -haloalkylsulfonyl, C_1-C_6 -alkylcarbonyl, C_1-C_6 -haloalkylcarbonyl, C_1-C_6 -alkoxycarbonyl or C_1-C_6 -haloalkoxycarbonyl;

or

35

two radicals R^6 , which are linked to the same carbon, together form an $-O-(CH_2)_m-O-$, $-O-(CH_2)_m-S-$, $-S-(CH_2)_m-S-$, $-O-(CH_2)_n-$ or $-S-(CH_2)_n$ chain which may be substituted by one to three radicals from the following group:

halogen, cyano, C_1-C_4 -alkyl, C_1-C_4 -haloalkyl or C_1-C_4 -alkoxycarbonyl;

or

45

two radicals R⁶, which are linked to the same carbon, together form a -(CH₂)_p chain which may be interrupted by oxygen or sulfur and/or may be substituted by one to four radicals from the following group:

5

halogen, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl or C₁-C₄-alkoxycarbonyl;

10

or

10

two radicals R⁶, which are linked to the same carbon, together form a methyldene group which may be substituted by one or two radicals from the following group:

15

halogen, hydroxyl, formyl, cyano, C₁-C₆-alkyl, C₁-C₆-haloalkyl, C₁-C₆-alkoxy, C₁-C₆-haloalkoxy, C₁-C₆-alkylthio, C₁-C₆-haloalkylthio, C₁-C₆-alkylsulfinyl, C₁-C₆-haloalkylsulfinyl, C₁-C₆-alkylsulfonyl or C₁-C₆-haloalkylsulfonyl;

20

or

20

two radicals R⁶, which are linked to the same carbon, together with this carbon form a carbonyl group;

25

or

30

two radicals R⁶, which are linked to different carbons, together form a -(CH₂)_n chain which may be substituted by one to three radicals from the following group:

35

halogen, C₁-C₆-alkyl, C₁-C₆-alkoxy, hydroxyl or C₁-C₆-alkoxycarbonyl;

40

R⁷ is C₁-C₆-alkyl, C₃-C₆-alkenyl, C₃-C₆-haloalkenyl, C₃-C₆-alkynyl, C₃-C₆-haloalkynyl, C₃-C₆-cycloalkyl,

C₁-C₂₀-alkylcarbonyl, C₂-C₆-alkenylcarbonyl, C₂-C₆-alkynylcarbonyl, C₃-C₆-cycloalkylcarbonyl, C₁-C₆-alkoxycarbonyl, C₃-C₆-alkenyloxycarbonyl, C₃-C₆-alkynyloxycarbonyl, (C₁-C₂₀-alkylthio)carbonyl,

45

C₁-C₆-alkylaminocarbonyl, C₃-C₆-alkynylaminocarbonyl, N,N-di-(C₁-C₆-alkyl)aminocarbonyl,

N-(C₃-C₆-alkenyl)-N-(C₁-C₆-alkyl)aminocarbonyl,
 N-(C₃-C₆-alkynyl)-N-(C₁-C₆-alkyl)aminocarbonyl,
 N-(C₁-C₆-alkoxy)-N-(C₁-C₆-alkyl)aminocarbonyl,
 N-(C₃-C₆-alkenyl)-N-(C₁-C₆-alkoxy)aminocarbonyl,
 N-(C₃-C₆-alkynyl)-N-(C₁-C₆-alkoxy)aminocarbonyl,
 di-(C₁-C₆-alkyl)-aminothiocarbonyl,
 C₁-C₆-alkylcarbonyl-C₁-C₆-alkyl,
 C₁-C₆-alkoxyimino-C₁-C₆-alkyl,
 N-(C₁-C₆-alkylamino)imino-C₁-C₆-alkyl or
 10 N,N-di-(C₁-C₆-alkylamino)imino-C₁-C₆-alkyl, where
 the abovementioned alkyl, cycloalkyl and alkoxy
 radicals may be partially or fully halogenated
 and/or may carry one to three of the following
 groups:
 15 cyano, C₁-C₄-alkoxy, C₁-C₄-alkylthio, di-(C₁-C₄-
 alkyl)amino, C₁-C₄-alkylcarbonyl,
 C₁-C₄-alkoxycarbonyl,
 C₁-C₄-alkoxy-C₁-C₄-alkoxycarbonyl,
 di-(C₁-C₄-alkyl)amino-C₁-C₄-alkoxycarbonyl,
 20 hydroxycarbonyl, C₁-C₄-alkylaminocarbonyl,
 di-(C₁-C₄-alkyl)aminocarbonyl, aminocarbonyl,
 C₁-C₄-alkylcarbonyloxy or C₃-C₆-cycloalkyl;
 25 phenyl, heterocyclyl, phenyl-C₁-C₆-alkyl,
 heterocyclyl-C₁-C₆-alkyl,
 phenylcarbonyl-C₁-C₆-alkyl,
 heterocyclylcarbonyl-C₁-C₆-alkyl, phenylcarbonyl,
 heterocyclylcarbonyl, phenoxy carbonyl,
 heterocycloloxy carbonyl, phenoxythiocarbonyl,
 heterocycloloxythiocarbonyl,
 phenoxy-C₁-C₆-alkylcarbonyl,
 heterocycloloxy-C₁-C₆-alkylcarbonyl,
 phenylaminocarbonyl,
 35 N-(C₁-C₆-alkyl)-N-(phenyl)aminocarbonyl,
 heterocyclylaminocarbonyl,
 N-(C₁-C₆-alkyl)-N-(heterocyclyl)aminocarbonyl,
 phenyl-C₂-C₆-alkenylcarbonyl or
 heterocyclyl-C₂-C₆-alkenylcarbonyl, where the
 phenyl and the heterocyclyl radical of the 20
 last-mentioned substituents may be partially or
 fully halogenated and/or may carry one to three of
 the following radicals:
 40 nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl,
 C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;
 45

R⁸, R⁹ are C₁-C₆-alkyl, C₃-C₆-alkenyl, C₃-C₆-haloalkenyl, C₃-C₆-alkynyl, C₃-C₆-haloalkynyl, C₃-C₆-cycloalkyl, hydroxyl, C₁-C₆-alkoxy, amino, C₁-C₆-alkylamino, C₁-C₆-haloalkylamino, di-(C₁-C₆-alkyl)amino or di-(C₁-C₆-haloalkyl)amino, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three of the following groups:

10 cyano, C₁-C₄-alkoxy, C₁-C₄-alkylthio, di-(C₁-C₄-alkyl)amino, C₁-C₄-alkylcarbonyl, C₁-C₄-alkoxycarbonyl, C₁-C₄-alkoxy-C₁-C₄-alkoxycarbonyl, di-(C₁-C₄-alkyl)amino-C₁-C₄-alkoxycarbonyl, 15 hydroxycarbonyl, C₁-C₄-alkylaminocarbonyl, di-(C₁-C₄-alkyl)aminocarbonyl, aminocarbonyl, C₁-C₄-alkylcarbonyloxy or C₃-C₆-cycloalkyl;

20 phenyl, heterocyclyl, phenyl-C₁-C₆-alkyl, heterocyclyl-C₁-C₆-alkyl, phenoxy, heterocyclylloxy, where the phenyl and the heterocyclyl radical of the last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

25 nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

R¹⁰ is C₁-C₆-alkyl, C₃-C₆-alkenyl, C₃-C₆-haloalkenyl, C₃-C₆-alkynyl, C₃-C₆-haloalkynyl, C₃-C₆-cycloalkyl, hydroxyl, C₁-C₆-alkoxy, C₃-C₆-alkenyloxy, C₃-C₆-alkynyloxy, amino, C₁-C₆-alkylamino, di-(C₁-C₆-alkyl)amino or C₁-C₆-alkylcarbonylamino, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three radicals from the following group:

30 cyano, C₁-C₄-alkoxy, C₁-C₄-alkylthio, di-(C₁-C₄-alkyl)amino, C₁-C₄-alkylcarbonyl, C₁-C₄-alkoxycarbonyl, 35 C₁-C₄-alkoxy-C₁-C₄-alkoxycarbonyl, di-(C₁-C₄-alkyl)amino-C₁-C₄-alkoxycarbonyl, hydroxycarbonyl, C₁-C₄-alkylaminocarbonyl, di-(C₁-C₄-alkyl)aminocarbonyl, aminocarbonyl, 40 C₁-C₄-alkylcarbonyloxy or C₃-C₆-cycloalkyl;

45

5 phenyl, heterocyclyl, phenyl-C₁-C₆-alkyl or heterocyclyl-C₁-C₆-alkyl, where the phenyl or heterocyclyl radical of the four last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

10 nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

15 R¹¹, R¹² are C₁-C₆-alkyl, C₃-C₆-alkenyl, C₃-C₆-alkynyl or C₁-C₆-alkylcarbonyl;

20 l is 0 to 6;

25 m is 2 to 4;

n is 1 to 5;

30 p is 2 to 5;

and their agriculturally useful salts.

35 Moreover, the invention relates to processes for preparing compounds of the formula I, to compositions comprising them and to the use of these derivatives or the compositions comprising them for controlling harmful plants.

40 The literature, for example WO 98/12 180 and EP-A 283 261, discloses quinolinoyl or fused phenyl derivatives which are linked to an unsubstituted or substituted (1-hydroxy-3-oxo-cyclohex-1-en-2-yl)carbonyl radical. However, the herbicidal properties of the prior art compounds and their compatibility with crop plants are not entirely satisfactory.

It is an object of the present invention to provide other biologically, in particular herbicidally, active compounds.

45 We have found that this object is achieved by the cyclohexenonequinolinoyl derivatives of the formula I and their herbicidal action.

45 Furthermore, we have found herbicidal compositions which comprise the compounds I and have very good herbicidal action. Moreover, we have found processes for preparing these compositions and

methods for controlling undesirable vegetation using the compounds I.

Depending on the substitution pattern, the compounds of the
5 formula I may contain one or more chiral centers, in which case
they are present as enantiomers or mixtures of diastereomers. The
invention provides both the pure enantiomers or diastereomers and
their mixtures.

10 The compounds of the formula I may also be present in the form of
their agriculturally useful salts, where the type of salt is
usually immaterial. In general, the salts of those cations and
the acid addition salts of those acids are suitable whose cations
15 and anions, respectively, do not negatively affect the herbicidal
action of the compounds I.

Suitable cations are, in particular, ions of the alkali metals,
preferably lithium, sodium and potassium, of the alkaline earth
20 metals, preferably calcium and magnesium, and of the transition
metals, preferably manganese, copper, zinc and iron, and also
ammonium, where, if desired, one to four hydrogen atoms may be
replaced by C_1 - C_4 -alkyl, hydroxy- C_1 - C_4 -alkyl,
 C_1 - C_4 -alkoxy- C_1 - C_4 -alkyl, hydroxy- C_1 - C_4 -alkoxy- C_1 - C_4 -alkyl, phenyl
25 or benzyl, preferably ammonium, dimethylammonium,
diisopropylammonium, tetramethylammonium, tetrabutylammonium,
2-(2-hydroxyeth-1-oxy)eth-1-ylammonium,
di(2-hydroxyeth-1-yl)ammonium, trimethylbenzylammonium,
furthermore phosphonium ions, sulfonium ions, preferably
30 tri(C_1 - C_4 -alkyl)sulfonium and sulfoxonium ions, preferably
tri(C_1 - C_4 -alkyl)sulfoxonium.

Anions of useful acid addition salts are primarily chloride,
bromide, fluoride, hydrogen sulfate, sulfate, dihydrogen
35 phosphate, hydrogen phosphate, nitrate, hydrogen carbonate,
carbonate, hexafluorosilicate, hexafluorophosphate, benzoate and
also the anions of C_1 - C_4 -alkanoic acids, preferably formate,
acetate, propionate and butyrate.

40 The organic moieties mentioned for the substituents R^1 - R^{12} or as
radicals on phenyl and heterocyclyl radicals are collective terms
for individual enumerations of the particular group members. All
hydrocarbon chains, i.e. all alkyl, haloalkyl, alkoxy,
haloalkoxy, alkylthio, haloalkylthio, alkylsulfonyl,
45 haloalkylsulfonyl, alkylsulfonyl, haloalkylsulfonyl,
N-alkylaminosulfonyl, N,N-dialkylaminosulfonyl, N-alkylamino,
N,N-dialkylamino, N-haloalkylamino, N-alkoxyamino,

N-alkoxy-N-alkylamino, N-alkylcarbonylamino,
 N-alkylsulfonylamino, N-haloalkylsulfonylamino,
 N-alkyl-N-alkylsulfonylamino, N-alkyl-N-haloalkylsulfonylamino,
 alkylcarbonyl, haloalkylcarbonyl, alkoxy carbonyl,
 5 haloalkoxycarbonyl, alkylthiocarbonyl, alkylcarbonyloxy,
 alkylaminocarbonyl, dialkylaminocarbonyl,
 dialkylaminothiocarbonyl, alkoxyalkyl, dialkoxy methyl,
 dialkylthiomethyl, (alkoxy)(alkylthio)methyl, alkylcarbonylalkyl,
 alkoxyiminomethyl, alkoxyiminoalkyl, N-(alkylamino)iminoalkyl,
 10 N-(dialkylamino)iminoalkyl, phenylalkenylcarbonyl,
 heterocyclalkenylcarbonyl, phenoxyalkylcarbonyl,
 heterocycloxyalkylcarbonyl, N-alkoxy-N-alkylaminocarbonyl,
 N-alkyl-N-phenylaminocarbonyl,
 N-alkyl-N-heterocyclaminocarbonyl, alkoxy carbonyloxy,
 15 phenylalkyl, heterocyclalkyl, phenylcarbonylalkyl,
 heterocyclcarbonylalkyl, dialkylaminoalkoxycarbonyl,
 alkoxyalkoxycarbonyl, alkenylcarbonyl, alkenyloxycarbonyl,
 alkenylaminocarbonyl, N-alkenyl-N-alkylaminocarbonyl,
 N-alkenyl-N-alkoxyaminocarbonyl, alkynylcarbonyl,
 20 alkynyloxycarbonyl, alkynylaminocarbonyl,
 N-alkynyl-N-alkylaminocarbonyl, N-alkynyl-N-alkoxyaminocarbonyl,
 alkenyl, alkynyl, haloalkenyl, haloalkynyl, alkenyloxy,
 alkynyloxy and alkoxyalkoxy moieties, may be straight-chain or
 branched. Unless indicated otherwise, halogenated substituents
 25 preferably carry one to five identical or different halogen
 atoms. The term "halogen" in each case represents fluorine,
 chlorine, bromine or iodine.

Examples of other meanings are:

30

- C₁—C₄—alkyl: for example methyl, ethyl, propyl, 1-methylethyl,
 butyl, 1-methylpropyl, 2-methylpropyl or 1,1-dimethylethyl;

35 — C₁—C₆—alkyl, and the alkyl moieties of
 C₁—C₆—alkoxyimino—C₁—C₆—alkyl,
 N—(C₁—C₆—alkylamino)imino—C₁—C₆—alkyl,
 N—(di—C₁—C₆—alkylamino)imino—C₁—C₆—alkyl,
 N—(C₁—C₆—alkoxy)—N—(C₁—C₆—
 40 alkyl)—aminocarbonyl,
 N—(C₃—C₆—alkenyl)—N—(C₁—C₆—alkyl)aminocarbonyl,
 (C₃—C₆—alkynyl)—N—(C₁—C₆—alkyl)aminocarbonyl,
 N—(C₁—C₆—alkyl)—N—phenylaminocarbonyl, N—(C₁—C₆—alkyl)—N—
 heterocyclaminocarbonyl, phenyl—C₁—C₆—alkyl, N—(C₁—C₆—
 45 alkyl)—N—(C₁—C₆—alkylsulfonyl)amino, N—(C₁—C₆—alkyl)—N—
 (C₁—C₆—haloalkylsulfonyl)amino, heterocycl—C₁—C₆—alkyl,
 phenylcarbonyl—C₁—C₆—alkyl, heterocyclcarbonyl—C₁—C₆—alkyl:

C_1-C_4 -alkyl as mentioned above, and also, for example, pentyl, 1-methylbutyl, 2-methylbutyl, 3-methylbutyl, 2,2-dimethylpropyl, 1-ethylpropyl, hexyl, 1,1-dimethylpropyl, 1,2-dimethylpropyl, 1-methylpentyl, 2-methylpentyl, 3-methylpentyl, 4-methylpentyl, 1,1-dimethylbutyl, 1,2-dimethylbutyl, 1,3-dimethylbutyl, 2,2-dimethylbutyl, 2,3-dimethylbutyl, 3,3-dimethylbutyl, 1-ethylbutyl, 2-ethylbutyl, 1,1,2-trimethylpropyl, 1-ethyl-1-methylpropyl or 1-ethyl-3-methylpropyl;

10

- C_1-C_4 -haloalkyl: a C_1-C_4 -alkyl radical as mentioned above which is partially or fully substituted by fluorine, chlorine, bromine and/or iodine, i.e., for example, chloromethyl, dichloromethyl, trichloromethyl, fluoromethyl, difluoromethyl, trifluoromethyl, chlorofluoromethyl, dichlorofluoromethyl, chlorodifluoromethyl, 2-fluoroethyl, 2-chloroethyl, 2-bromoethyl, 2-iodoethyl, 2,2-difluoroethyl, 2,2,2-trifluoroethyl, 2-chloro-2-fluoroethyl, 2-chloro-2,2-difluoroethyl, 2,2-dichloro-2-fluoroethyl, 2,2,2-trichloroethyl, pentafluoroethyl, 2-fluoropropyl, 3-fluoropropyl, 2,2-difluoropropyl, 2,3-difluoropropyl, 2-chloropropyl, 3-chloropropyl, 2,3-dichloropropyl, 2-bromopropyl, 3-bromopropyl, 3,3,3-trifluoropropyl, 3,3,3-trichloropropyl, 2,2,3,3,3-pentafluoropropyl, heptafluoropropyl, 1-(fluoromethyl)-2-fluoroethyl, 1-(chloromethyl)-2-chloroethyl, 1-(bromomethyl)-2-bromoethyl, 4-fluorobutyl, 4-chlorobutyl, 4-bromobutyl or nonafluorobutyl;
- C_1-C_6 -haloalkyl, and the haloalkyl moieties of $N-C_1-C_6$ -haloalkylamino: C_1-C_4 -haloalkyl, as mentioned above, and also, for example, 5-fluoropentyl, 5-chloropentyl, 5-bromopentyl, 5-iodopentyl, undecafluoropentyl, 6-fluorohexyl, 6-chlorohexyl, 6-bromohexyl, 6-iodohexyl or dodecafluorohexyl;
- C_1-C_4 -alkoxy: for example methoxy, ethoxy, propoxy, 1-methylethoxy, butoxy, 1-methylpropoxy, 2-methylpropoxy or 1,1-dimethylethoxy;
- C_1-C_6 -alkoxy, and the alkoxy moieties of $N-C_1-C_6$ -alkoxyamino, di- $(C_1-C_6$ -alkoxy)methyl, $(C_1-C_6$ -alkoxy) $(C_1-C_6$ -alkylthio)-methyl, C_1-C_6 -alkoxyiminomethyl, C_1-C_6 -alkoxyimino- C_1-C_6 -alkyl, $N-(C_1-C_6$ -alkoxy)- $N-(C_1-C_6$ -alkyl)aminocarbonyl, $N-(C_3-C_6$ -alkenyl)- $N-(C_1-C_6$ -alkoxy)aminocarbonyl and

N-(C₃-C₆-alkynyl)-N-(C₁-C₆-alkoxy)aminocarbonyl: C₁-C₄-alkoxy as mentioned above, and also, for example, pentoxy, 1-methylbutoxy, 2-methylbutoxy, 3-methylbutoxy, 1,1-dimethylpropoxy, 1,2-dimethylpropoxy, 5 2,2-dimethylpropoxy, 1-ethylpropoxy, hexoxy, 1-methylpentoxy, 2-methylpentoxy, 3-methylpentoxy, 4-methylpentoxy, 1,1-dimethylbutoxy, 1,2-dimethylbutoxy, 1,3-dimethylbutoxy, 2,2-dimethylbutoxy, 2,3-dimethylbutoxy, 3,3-dimethylbutoxy, 1-ethylbutoxy, 2-ethylbutoxy, 1,1,2-trimethylpropoxy, 10 1,2,2-trimethylpropoxy, 1-ethyl-1-methylpropoxy or 1-ethyl-2-methylpropoxy;

— C₁-C₄-haloalkoxy: a C₁-C₄-alkoxy radical as mentioned above which is partially or fully substituted by fluorine, 15 chlorine, bromine and/or iodine, i.e., for example, fluoromethoxy, difluoromethoxy, trifluoromethoxy, chlorodifluoromethoxy, bromodifluoromethoxy, 2-fluoroethoxy, 2-chloroethoxy, 2-bromomethoxy, 2-iodoethoxy, 20 2,2-difluoroethoxy, 2,2,2-trifluoroethoxy, 2-chloro-2-fluoroethoxy, 2-chloro-2,2-difluoroethoxy, 2,2-dichloro-2-fluoroethoxy, 2,2,2-trichloroethoxy, pentafluoroethoxy, 2-fluoropropoxy, 3-fluoropropoxy, 2-chloropropoxy, 3-chloropropoxy, 2-bromopropoxy, 25 3-bromopropoxy, 2,2-difluoropropoxy, 2,3-difluoropropoxy, 2,3-dichloropropoxy, 3,3,3-trifluoropropoxy, 3,3,3-trichloropropoxy, 2,2,3,3,3-pentafluoropropoxy, heptafluoropropoxy, 1-(fluoromethyl)-2-fluoroethoxy, 1-(chloromethyl)-2-chloroethoxy, 1-(bromomethyl)-2-bromoethoxy, 4-fluorobutoxy, 30 4-chlorobutoxy, 4-bromobutoxy or nonafluorobutoxy;

— C₁-C₆-haloalkoxy: C₁-C₄-haloalkoxy as mentioned above, and also, for example, 5-fluoropentoxy, 5-chloropentoxy, 35 5-bromopentoxy, 5-iodopentoxy, undecafluoropentoxy, 6-fluorohexoxy, 6-chlorohexoxy, 6-bromohexoxy, 6-iodohexoxy or dodecafluorohexoxy;

— C₁-C₄-alkylthio: for example methylthio, ethylthio, 40 propylthio, 1-methylethylthio, butylthio, 1-methylpropylthio, 2-methylpropylthio or 1,1-dimethylethylthio;

— C₁-C₆-alkylthio, and the alkylthio moieties of (C₁-C₆-alkylthio)carbonyl, di-(C₁-C₆-alkylthio)methyl and (C₁-C₆-alkoxy)-(C₁-C₆-alkylthio)methyl: C₁-C₄-alkylthio as 45 mentioned above, and also, for example, pentylthio, 1-methylbutylthio, 2-methylbutylthio, 3-methylbutylthio,

2,2-dimethylpropylthio, 1-ethylpropylthio, hexylthio,
 1,1-dimethylpropylthio, 1,2-dimethylpropylthio,
 1-methylpentylthio, 2-methylpentylthio, 3-methylpentylthio,
 4-methylpentylthio, 1,1-dimethylbutylthio,
 5 1,2-dimethylbutylthio, 1,3-dimethylbutylthio,
 2,2-dimethylbutylthio, 2,3-dimethylbutylthio,
 3,3-dimethylbutylthio, 1-ethylbutylthio, 2-ethylbutylthio,
 1,1,2-trimethylpropylthio, 1,2,2-trimethylpropylthio,
 10 1-ethyl-1-methylpropylthio or 1-ethyl-2-methylpropylthio;

10 - C₁-C₂₀-alkylthio as alkylthio radical of
 (C₁-C₂₀-alkylthio)carbonyl: C₁-C₆-alkylthio as mentioned
 above, and also, for example, heptylthio, octylthio,
 hexadecylthio or octadecylthio;

15 - C₁-C₄-haloalkylthio: a C₁-C₄-alkylthio radical as mentioned
 above which is partially or fully substituted by fluorine,
 chlorine, bromine and/or iodine, i.e., for example,
 fluoromethylthio, difluoromethylthio, trifluoromethylthio,
 20 chlorodifluoromethylthio, bromodifluoromethylthio,
 2-fluoroethylthio, 2-chloroethylthio, 2-bromoethylthio,
 2-iodoethylthio, 2,2-difluoroethylthio,
 2,2,2-trifluoroethylthio, 2,2,2-trichloroethylthio,
 25 2-chloro-2-fluoroethylthio, 2-chloro-2,2-difluoroethylthio,
 2,2-dichloro-2-fluoroethylthio, pentafluoroethylthio,
 2-fluoropropylthio, 3-fluoropropylthio, 2-chloropropylthio,
 3-chloropropylthio, 2-bromopropylthio, 3-bromopropylthio,
 2,2-difluoropropylthio, 2,3-difluoropropylthio,
 30 2,3-dichloropropylthio, 3,3,3-trifluoropropylthio,
 3,3,3-trichloropropylthio, 2,2,3,3,3-pentafluoropropylthio,
 heptafluoropropylthio, 1-(fluoromethyl)-2-fluoroethylthio,
 1-(chloromethyl)-2-chloroethylthio,
 1-(bromomethyl)-2-bromoethylthio, 4-fluorobutylthio,
 4-chlorobutylthio, 4-bromobutylthio or nonafluorobutylthio;

35 - C₁-C₆-haloalkylthio: C₁-C₄-haloalkylthio, as mentioned above,
 and also, for example, 5-fluoropentylthio,
 5-chloropentylthio, 5-bromopentylthio, 5-iodopentylthio,
 40 5-undecafluoropentylthio, 6-fluorohexylthio, 6-chlorohexylthio,
 6-bromohexylthio, 6-iodohexylthio or dodecafluorohexylthio;

45 - C₁-C₆-alkylsulfinyl (C₁-C₆-alkyl-S(=O)-): for example
 methylsulfinyl, ethylsulfinyl, propylsulfinyl,
 1-methylethylsulfinyl, butylsulfinyl, 1-methylpropylsulfinyl,
 2-methylpropylsulfinyl, 1,1-dimethylethylsulfinyl,
 pentylsulfinyl, 1-methylbutylsulfinyl, 2-methylbutylsulfinyl,

3-methylbutylsulfinyl, 2,2-dimethylpropylsulfinyl,
 1-ethylpropylsulfinyl, 1,1-dimethylpropylsulfinyl,
 1,2-dimethylpropylsulfinyl, hexylsulfinyl,
 1-methylpentylsulfinyl, 2-methylpentylsulfinyl,
 5 3-methylpentylsulfinyl, 4-methylpentylsulfinyl,
 1,1-dimethylbutylsulfinyl, 1,2-dimethylbutylsulfinyl,
 1,3-dimethylbutylsulfinyl, 2,2-dimethylbutylsulfinyl,
 2,3-dimethylbutylsulfinyl, 3,3-dimethylbutylsulfinyl,
 1-ethylbutylsulfinyl, 2-ethylbutylsulfinyl,
 10 1,1,2-trimethylpropylsulfinyl, 1,2,2-trimethylpropylsulfinyl,
 1-ethyl-1-methylpropylsulfinyl or
 1-ethyl-2-methylpropylsulfinyl;

15 - C_1-C_6 -haloalkylsulfinyl: a C_1-C_6 -alkylsulfinyl radical as
 mentioned above which is partially or fully substituted by
 fluorine, chlorine, bromine and/or iodine, i.e., for example,
 fluoromethylsulfinyl, difluoromethylsulfinyl,
 trifluoromethylsulfinyl, chlorodifluoromethylsulfinyl,
 bromodifluoromethylsulfinyl, 2-fluoroethylsulfinyl,
 20 2-chloroethylsulfinyl, 2-bromoethylsulfinyl,
 2-iodoethylsulfinyl, 2,2-difluoroethylsulfinyl,
 2,2,2-trifluoroethylsulfinyl, 2,2,2-trichloroethylsulfinyl,
 2-chloro-2-fluoroethylsulfinyl,
 25 2-chloro-2,2-difluoroethylsulfinyl,
 2,2-dichloro-2-fluoroethylsulfinyl, pentafluoroethylsulfinyl,
 2-fluoropropylsulfinyl, 3-fluoropropylsulfinyl,
 2-chloropropylsulfinyl, 3-chloropropylsulfinyl,
 2-bromopropylsulfinyl, 3-bromopropylsulfinyl,
 2,2-difluoropropylsulfinyl, 2,3-difluoropropylsulfinyl,
 30 2,3-dichloropropylsulfinyl, 3,3,3-trifluoropropylsulfinyl,
 3,3,3-trichloropropylsulfinyl,
 2,2,3,3,3-pentafluoropropylsulfinyl,
 heptafluoropropylsulfinyl,
 1-(fluoromethyl)-2-fluoroethylsulfinyl,
 35 1-(chloromethyl)-2-chloroethylsulfinyl,
 1-(bromomethyl)-2-bromoethylsulfinyl, 4-fluorobutylsulfinyl,
 4-chlorobutylsulfinyl, 4-bromobutylsulfinyl,
 nonafluorobutylsulfinyl, 5-fluoropentylsulfinyl,
 5-chloropentylsulfinyl, 5-bromopentylsulfinyl,
 40 5-iodopentylsulfinyl, undecafluoropentylsulfinyl,
 6-fluorohexylsulfinyl, 6-chlorohexylsulfinyl,
 6-bromohexylsulfinyl, 6-iodohexylsulfinyl or
 dodecafluorohexylsulfinyl;

45 - C_1-C_6 -alkylsulfonyl (C_1-C_6 -alkyl- $S(=O)_2-$), and the
 alkylsulfonyl radicals of $N-(C_1-C_6$ -alkylsulfonyl)amino and
 $N-(C_1-C_6$ -alkyl)- $N-(C_1-C_6$ -alkylsulfonyl)amino: for example,

methylsulfonyl, ethylsulfonyl, propylsulfonyl,
 1-methylethylsulfonyl, butylsulfonyl, 1-methylpropylsulfonyl,
 2-methylpropylsulfonyl, 1,1-dimethylethylsulfonyl,
 pentylsulfonyl, 1-methylbutylsulfonyl, 2-methylbutylsulfonyl,
 5 3-methylbutylsulfonyl, 1,1-dimethylpropylsulfonyl,
 1,2-dimethylpropylsulfonyl, 2,2-dimethylpropylsulfonyl,
 1-ethylpropylsulfonyl, hexylsulfonyl, 1-methylpentylsulfonyl,
 2-methylpentylsulfonyl, 3-methylpentylsulfonyl,
 10 4-methylpentylsulfonyl, 1,1-dimethylbutylsulfonyl,
 1,2-dimethylbutylsulfonyl, 1,3-dimethylbutylsulfonyl,
 2,2-dimethylbutylsulfonyl, 2,3-dimethylbutylsulfonyl,
 3,3-dimethylbutylsulfonyl, 1-ethylbutylsulfonyl,
 2-ethylbutylsulfonyl, 1,1,2-trimethylpropylsulfonyl,
 1,2,2-trimethylpropylsulfonyl, 1-ethyl-1-methylpropylsulfonyl
 15 or 1-ethyl-2-methylpropylsulfonyl;

— C_1-C_6 -haloalkylsulfonyl, and the haloalkylsulfonyl radicals of
 $N-(C_1-C_6\text{-haloalkylsulfonyl})\text{amino}$ and
 $N-(C_1-C_6\text{-alkyl})-N-(C_1-C_6\text{-haloalkylsulfonyl})\text{amino}$: a
 20 C_1-C_6 -alkylsulfonyl radical as mentioned above which is
 partially or fully substituted by fluorine, chlorine, bromine
 and/or iodine, i.e., for example, fluoromethylsulfonyl,
 difluoromethylsulfonyl, trifluoromethylsulfonyl,
 chlorodifluoromethylsulfonyl, bromodifluoromethylsulfonyl,
 25 2-fluoroethylsulfonyl, 2-chloroethylsulfonyl,
 2-bromoethylsulfonyl, 2-iodoethylsulfonyl,
 2,2-difluoroethylsulfonyl, 2,2,2-trifluoroethylsulfonyl,
 2-chloro-2-fluoroethylsulfonyl,
 30 2-chloro-2,2-difluoroethylsulfonyl,
 2,2-dichloro-2-fluoroethylsulfonyl,
 2,2,2-trichloroethylsulfonyl, pentafluoroethylsulfonyl,
 2-fluoropropylsulfonyl, 3-fluoropropylsulfonyl,
 2-chloropropylsulfonyl, 3-chloropropylsulfonyl,
 2-bromopropylsulfonyl, 3-bromopropylsulfonyl,
 35 2,2-difluoropropylsulfonyl, 2,3-difluoropropylsulfonyl,
 2,3-dichloropropylsulfonyl, 3,3,3-trifluoropropylsulfonyl,
 3,3,3-trichloropropylsulfonyl,
 2,2,3,3,3-pentafluoropropylsulfonyl,
 heptafluoropropylsulfonyl,
 40 1-(fluoromethyl)-2-fluoroethylsulfonyl,
 1-(chloromethyl)-2-chloroethylsulfonyl,
 1-(bromomethyl)-2-bromoethylsulfonyl, 4-fluorobutylsulfonyl,
 4-chlorobutylsulfonyl, 4-bromobutylsulfonyl,
 nonafluorobutylsulfonyl, 5-fluoropentylsulfonyl,
 45 5-chloropentylsulfonyl, 5-bromopentylsulfonyl,
 5-iodopentylsulfonyl, 6-fluorohexylsulfonyl,

6-bromohexylsulfonyl, 6-iodohexylsulfonyl or
dodecafluorohexylsulfonyl;

5 - C_1-C_6 -alkylamino, and the alkylamino radicals of
 $N-(C_1-C_6$ -alkylamino)imino- C_1-C_6 -alkyl: for example
methylamino, ethylamino, propylamino, 1-methylethylamino,
butylamino, 1-methylpropylamino, 2-methylpropylamino,
1,1-dimethylethylamino, pentylamino, 1-methylbutylamino,
2-methylbutylamino, 3-methylbutylamino,
10 2,2-dimethylpropylamino, 1-ethylpropylamino, hexylamino,
1,1-dimethylpropylamino, 1,2-dimethylpropylamino,
1-methylpentylamino, 2-methylpentylamino,
3-methylpentylamino, 4-methylpentylamino,
1,1-dimethylbutylamino, 1,2-dimethylbutylamino,
15 1,3-dimethylbutylamino, 2,2-dimethylbutylamino,
2,3-dimethylbutylamino, 3,3-dimethylbutylamino,
1-ethylbutylamino, 2-ethylbutylamino,
1,1,2-trimethylpropylamino, 1,2,2-trimethylpropylamino,
1-ethyl-1-methylpropylamino or 1-ethyl-2-methylpropylamino;

20 - $(C_1-C_4$ -alkylamino)sulfonyl: for example methylaminosulfonyl,
ethylaminosulfonyl, propylaminosulfonyl,
1-methylethylaminosulfonyl, butylaminosulfonyl,
25 1-methylpropylaminosulfonyl, 2-methylpropylaminosulfonyl or
1,1-dimethylethylaminosulfonyl;

30 - $(C_1-C_6$ -alkylamino)sulfonyl: $(C_1-C_4$ -alkylamino)sulfonyl, as
mentioned above, and also, for example, pentylaminosulfonyl,
1-methylbutylaminosulfonyl, 2-methylbutylaminosulfonyl,
3-methylbutylaminosulfonyl, 2,2-dimethylpropylaminosulfonyl,
1-ethylpropylaminosulfonyl, hexylaminosulfonyl,
1,1-dimethylpropylaminosulfonyl,
1,2-dimethylpropylaminosulfonyl, 1-methylpentylaminosulfonyl,
35 2-methylpentylaminosulfonyl, 3-methylpentylaminosulfonyl,
4-methylpentylaminosulfonyl, 1,1-dimethylbutylaminosulfonyl,
1,2-dimethylbutylaminosulfonyl,
1,3-dimethylbutylaminosulfonyl,
2,2-dimethylbutylaminosulfonyl,
40 2,3-dimethylbutylaminosulfonyl,
3,3-dimethylbutylaminosulfonyl, 1-ethylbutylaminosulfonyl,
2-ethylbutylaminosulfonyl,
1,1,2-trimethylpropylaminosulfonyl,
1,2,2-trimethylpropylaminosulfonyl,
45 1-ethyl-1-methylpropylaminosulfonyl or
1-ethyl-2-methylpropylaminosulfonyl;

- di-(C₁-C₄-alkyl)aminosulfonyl: for example
 N,N-dimethylaminosulfonyl, N,N-diethylaminosulfonyl,
 N,N-di-(1-methylethyl)aminosulfonyl,
 N,N-dipropylaminosulfonyl, N,N-dibutylaminosulfonyl,
 5 N,N-di-(1-methylpropyl)aminosulfonyl,
 N,N-di-(2-methylpropyl)aminosulfonyl,
 N,N-di-(1,1-dimethylethyl)aminosulfonyl,
 N-ethyl-N-methylaminosulfonyl,
 N-methyl-N-propylaminosulfonyl,
 10 N-methyl-N-(1-methylethyl)aminosulfonyl,
 N-butyl-N-methylaminosulfonyl,
 N-methyl-N-(1-methylpropyl)aminosulfonyl,
 N-methyl-N-(2-methylpropyl)aminosulfonyl,
 N-(1,1-dimethylethyl)-N-methylaminosulfonyl,
 15 N-ethyl-N-propylaminosulfonyl,
 N-ethyl-N-(1-methylethyl)aminosulfonyl,
 N-butyl-N-ethylaminosulfonyl,
 N-ethyl-N-(1-methylpropyl)aminosulfonyl,
 N-ethyl-N-(2-methylpropyl)aminosulfonyl,
 20 N-ethyl-N-(1,1-dimethylethyl)aminosulfonyl,
 N-(1-methylethyl)-N-propylaminosulfonyl,
 N-butyl-N-propylaminosulfonyl,
 N-(1-methylpropyl)-N-propylaminosulfonyl,
 N-(2-methylpropyl)-N-propylaminosulfonyl,
 25 N-(1,1-dimethylethyl)-N-propylaminosulfonyl, N-butyl-N-(1-methylethyl)aminosulfonyl,
 N-(1-methylethyl)-N-(1-methylpropyl)aminosulfonyl,
 N-(1-methylethyl)-N-(2-methylpropyl)aminosulfonyl,
 N-(1,1-dimethylethyl)-N-(1-methylethyl)aminosulfonyl,
 30 N-butyl-N-(1-methylpropyl)aminosulfonyl,
 N-butyl-N-(2-methylpropyl)aminosulfonyl,
 N-butyl-N-(1,1-dimethylethyl)aminosulfonyl,
 N-(1-methylpropyl)-N-(2-methylpropyl)aminosulfonyl,
 N-(1,1-dimethylethyl)-N-(1-methylpropyl)aminosulfonyl or
 35 N-(1,1-dimethylethyl)-N-(2-methylpropyl)aminosulfonyl;
- di-(C₁-C₆-alkyl)aminosulfonyl: di-(C₁-C₄-alkyl)aminosulfonyl, as mentioned above, and also, for example,
 N-methyl-N-pentylaminosulfonyl,
 40 N-methyl-N-(1-methylbutyl)aminosulfonyl,
 N-methyl-N-(2-methylbutyl)aminosulfonyl,
 N-methyl-N-(3-methylbutyl)aminosulfonyl, N-methyl-N-(2,2-dimethylpropyl)aminosulfonyl,
 N-methyl-N-(1-ethylpropyl)aminosulfonyl,
 45 N-methyl-N-hexylaminosulfonyl,
 N-methyl-N-(1,1-dimethylpropyl)aminosulfonyl, N-methyl-N-(1,2-dimethylpropyl)aminosulfonyl,

N-methyl-N-(1-methylpentyl)aminosulfonyl,
N-methyl-N-(2-methylpentyl)aminosulfonyl,
N-methyl-N-(3-methylpentyl)aminosulfonyl,
N-methyl-N-(4-methylpentyl)aminosulfonyl, N-methyl-N-
5 (1,1-dimethylbutyl)aminosulfonyl,
N-methyl-N-(1,2-dimethylbutyl)aminosulfonyl,
N-methyl-N-(1,3-dimethylbutyl)aminosulfonyl,
N-methyl-N-(2,2-dimethylbutyl)aminosulfonyl,
N-methyl-N-(2,3-dimethylbutyl)aminosulfonyl, N-methyl-N-
10 (3,3-dimethylbutyl)aminosulfonyl,
N-methyl-N-(1-ethylbutyl)aminosulfonyl,
N-methyl-N-(2-ethylbutyl)aminosulfonyl,
N-methyl-N-(1,1,2-trimethylpropyl)aminosulfonyl,
N-methyl-N-(1,2,2-trimethylpropyl)aminosulfonyl,
15 N-methyl-N-(1-ethyl-1-methylpropyl)aminosulfonyl, N-methyl-N-
(1-ethyl-2-methylpropyl)aminosulfonyl,
N-ethyl-N-pentylaminosulfonyl,
N-ethyl-N-(1-methylbutyl)aminosulfonyl,
N-ethyl-N-(2-methylbutyl)aminosulfonyl,
20 N-ethyl-N-(3-methylbutyl)aminosulfonyl,
N-ethyl-N-(2,2-dimethylpropyl)aminosulfonyl,
N-ethyl-N-(1-ethylpropyl)aminosulfonyl,
N-ethyl-N-hexylaminosulfonyl,
N-ethyl-N-(1,1-dimethylpropyl)aminosulfonyl,
25 N-ethyl-N-(1,2-dimethylpropyl)aminosulfonyl,
N-ethyl-N-(1-methylpentyl)aminosulfonyl,
N-ethyl-N-(2-methylpentyl)aminosulfonyl,
N-ethyl-N-(3-methylpentyl)aminosulfonyl,
N-ethyl-N-(4-methylpentyl)aminosulfonyl,
30 N-ethyl-N-(1,1-dimethylbutyl)aminosulfonyl,
N-ethyl-N-(1,2-dimethylbutyl)aminosulfonyl,
N-ethyl-N-(1,3-dimethylbutyl)aminosulfonyl,
N-ethyl-N-(2,2-dimethylbutyl)aminosulfonyl,
N-ethyl-N-(2,3-dimethylbutyl)aminosulfonyl,
35 N-ethyl-N-(3,3-dimethylbutyl)aminosulfonyl,
N-ethyl-N-(1-ethylbutyl)aminosulfonyl,
N-ethyl-N-(2-ethylbutyl)aminosulfonyl,
N-ethyl-N-(1,1,2-trimethylpropyl)aminosulfonyl,
N-ethyl-N-(1,2,2-trimethylpropyl)aminosulfonyl,
40 N-ethyl-N-(1-ethyl-1-methylpropyl)aminosulfonyl,
N-ethyl-N-(1-ethyl-2-methylpropyl)aminosulfonyl,
N-propyl-N-pentylaminosulfonyl,
N-butyl-N-pentylaminosulfonyl, N,N-dipentylaminosulfonyl,
N-propyl-N-hexylaminosulfonyl, N-butyl-N-hexylaminosulfonyl,
45 N-pentyl-N-hexylaminosulfonyl or N,N-dihexylaminosulfonyl;

- di-(C₁-C₄-alkyl)amino and the dialkylamino radicals of:
 di-(C₁-C₄-alkyl)amino-C₁-C₄-alkoxycarbonyl and
 N-(di-C₁-C₄-alkylamino)imino-C₁-C₆-alkyl for example
 N,N-dimethylamino, N,N-diethylamino, N,N-dipropylamino,
 5 N,N-di-(1-methylethyl)amino, N,N-dibutylamino,
 N,N-di-(1-methylpropyl)amino, N,N-di-(2-methylpropyl)amino,
 N,N-di-(1,1-dimethylethyl)amino, N-ethyl-N-methylamino,
 N-methyl-N-propylamino, N-methyl-N-(1-methylethyl)amino,
 N-butyl-N-methylamino, N-methyl-N-(1-methylpropyl)amino,
 10 N-methyl-N-(2-methylpropyl)amino,
 N-(1,1-dimethylethyl)-N-methylamino, N-ethyl-N-propylamino,
 N-ethyl-N-(1-methylethyl)amino, N-butyl-N-ethylamino,
 N-ethyl-N-(1-methylpropyl)amino,
 N-ethyl-N-(2-methylpropyl)amino,
 15 N-ethyl-N-(1,1-dimethylethyl)amino,
 N-(1-methylethyl)-N-propylamino, N-butyl-N-propylamino,
 N-(1-methylpropyl)-N-propylamino,
 N-(2-methylpropyl)-N-propylamino,
 N-(1,1-dimethylethyl)-N-propylamino,
 20 N-butyl-N-(1-methylethyl)amino,
 N-(1-methylethyl)-N-(1-methylpropyl)amino,
 N-(1-methylethyl)-N-(2-methylpropyl)amino,
 N-(1,1-dimethylethyl)-N-(1-methylethyl)amino,
 N-butyl-N-(1-methylpropyl)amino,
 25 N-butyl-N-(2-methylpropyl)amino,
 N-butyl-N-(1,1-dimethylethyl)amino,
 N-(1-methylpropyl)-N-(2-methylpropyl)amino,
 N-(1,1-dimethylethyl)-N-(1-methylpropyl)amino or
 N-(1,1-dimethylethyl)-N-(2-methylpropyl)amino;
 30
- di-(C₁-C₆-alkyl)amino, and the dialkylamino radicals of
 di-(C₁-C₆-alkyl)amino-imino-C₁-C₆-alkyl: di-(C₁-C₄-alkyl)amino
 as mentioned above, and also N,N-dipentylamino,
 N,N-dihexylamino, N-methyl-N-pentylamino,
 35 N-ethyl-N-pentylamino, N-methyl-N-hexylamino or
 N-ethyl-N-hexylamino;
- C₁-C₄-alkylcarbonyl: for example methylcarbonyl,
 ethylcarbonyl, propylcarbonyl, 1-methylethylcarbonyl,
 40 butylcarbonyl, 1-methylpropylcarbonyl, 2-methylpropylcarbonyl
 or 1,1-dimethylethylcarbonyl;
- C₁-C₆-alkylcarbonyl, and the alkylcarbonyl radicals of
 phenoxy-C₁-C₆-alkylcarbonyl,
 heterocyclyloxy-C₁-C₆-alkylcarbonyl, C₁-C₆-alkylcarbonylamino,
 45 C₁-C₆-alkylcarbonyl-C₁-C₆-alkyl: C₁-C₄-alkylcarbonyl, as

mentioned above, and also, for example, pentylcarbonyl,
 1-methylbutylcarbonyl, 2-methylbutylcarbonyl,
 3-methylbutylcarbonyl, 2,2-dimethylpropylcarbonyl,
 1-ethylpropylcarbonyl, hexylcarbonyl,
 5 1,1-dimethylpropylcarbonyl, 1,2-dimethylpropylcarbonyl,
 1-methylpentylcarbonyl, 2-methylpentylcarbonyl,
 3-methylpentylcarbonyl, 4-methylpentylcarbonyl,
 1,1-dimethylbutylcarbonyl, 1,2-dimethylbutylcarbonyl,
 10 1,3-dimethylbutylcarbonyl, 2,2-dimethylbutylcarbonyl,
 2,3-dimethylbutylcarbonyl, 3,3-dimethylbutylcarbonyl,
 1-ethylbutylcarbonyl, 2-ethylbutylcarbonyl,
 1,1,2-trimethylpropylcarbonyl, 1,2,2-trimethylpropylcarbonyl,
 1-ethyl-1-methylpropylcarbonyl or
 1-ethyl-2-methylpropylcarbonyl;

15 - C_1-C_{20} -alkylcarbonyl: C_1-C_6 -alkylcarbonyl, as mentioned above,
 and also heptylcarbonyl, octylcarbonyl, pentadecylcarbonyl or
 heptadecylcarbonyl;

20 - C_1-C_6 -haloalkylcarbonyl: a C_1-C_6 -alkylcarbonyl radical as
 mentioned above which is partially or fully substituted by
 fluorine, chlorine, bromine and/or iodine, i.e., for example,
 chloroacetyl, dichloroacetyl, trichloroacetyl, fluoroacetyl,
 25 difluoroacetyl, trifluoroacetyl, chlorofluoroacetyl,
 dichlorofluoroacetyl, chlorodifluoroacetyl,
 2-fluoroethylcarbonyl, 2-chloroethylcarbonyl,
 2-bromoethylcarbonyl, 2-iodoethylcarbonyl,
 2,2-difluoroethylcarbonyl, 2,2,2-trifluoroethylcarbonyl,
 30 2-chloro-2-fluoroethylcarbonyl,
 2-chloro-2,2-difluoroethylcarbonyl,
 2,2-dichloro-2-fluoroethylcarbonyl,
 2,2,2-trichloroethylcarbonyl, pentafluoroethylcarbonyl,
 2-fluoropropylcarbonyl, 3-fluoropropylcarbonyl,
 35 2,2-difluoropropylcarbonyl, 2,3-difluoropropylcarbonyl,
 2-chloropropylcarbonyl, 3-chloropropylcarbonyl,
 2,3-dichloropropylcarbonyl, 2-bromopropylcarbonyl,
 3-bromopropylcarbonyl, 3,3,3-trifluoropropylcarbonyl,
 3,3,3-trichloropropylcarbonyl,
 40 2,2,3,3,3-pentafluoropropylcarbonyl,
 heptafluoropropylcarbonyl,
 1-(fluoromethyl)-2-fluoroethylcarbonyl,
 1-(chloromethyl)-2-chloroethylcarbonyl,
 1-(bromomethyl)-2-bromoethylcarbonyl, 4-fluorobutylcarbonyl,
 45 4-chlorobutylcarbonyl, 4-bromobutylcarbonyl,
 nonafluorobutylcarbonyl, 5-fluoropentylcarbonyl,
 5-chloropentylcarbonyl, 5-bromopentylcarbonyl,
 Perfluoropentylcarbonyl, 6-fluorohexylcarbonyl,

6-chlorohexylcarbonyl, 6-bromohexylcarbonyl or
Perfluorohexylcarbonyl;

5 - C_1-C_4 -alkoxycarbonyl, and the alkoxycarbonyl moieties of
 $di-(C_1-C_4-alkyl)amino-C_1-C_4$ -alkoxycarbonyl, for example
methoxycarbonyl, ethoxycarbonyl, propoxycarbonyl,
1-methylmethoxycarbonyl, butoxycarbonyl,
1-methylpropoxycarbonyl, 2-methylpropoxycarbonyl or
1,1-dimethylmethoxycarbonyl;

10

15 - $(C_1-C_6-alkoxy)carbonyl$, and the alkoxycarbonyl moieties of
 C_1-C_6 -alkoxycarbonyloxy: $(C_1-C_4-alkoxy)carbonyl$, as mentioned
above, and also, for example, pentoxy carbonyl,
1-methylbutoxycarbonyl, 2-methylbutoxycarbonyl,
3-methylbutoxycarbonyl, 2,2-dimethylpropoxycarbonyl,
1-ethylpropoxycarbonyl, hexoxycarbonyl,
1,1-dimethylpropoxycarbonyl, 1,2-dimethylpropoxycarbonyl,
1-methylpentoxy carbonyl, 2-methylpentoxy carbonyl,
3-methylpentoxy carbonyl, 4-methylpentoxy carbonyl,
1,1-dimethylbutoxycarbonyl, 1,2-dimethylbutoxycarbonyl,
1,3-dimethylbutoxycarbonyl, 2,2-dimethylbutoxycarbonyl,
2,3-dimethylbutoxycarbonyl, 3,3-dimethylbutoxycarbonyl,
1-ethylbutoxycarbonyl, 2-ethylbutoxycarbonyl,
1,1,2-trimethylpropoxycarbonyl,
1,2,2-trimethylpropoxycarbonyl,
1-ethyl-1-methylpropoxycarbonyl or
1-ethyl-2-methylpropoxycarbonyl;

20

25

30 - C_1-C_6 -haloalkoxycarbonyl: a C_1-C_6 -alkoxycarbonyl radical as
mentioned above which is partially or fully substituted by
fluorine, chlorine, bromine and/or iodine, i.e., for example,
fluoromethoxycarbonyl, difluoromethoxycarbonyl,
trifluoromethoxycarbonyl, chlorodifluoromethoxycarbonyl,
bromodifluoromethoxycarbonyl, 2-fluoroethoxycarbonyl,
2-chloroethoxycarbonyl, 2-bromoethoxycarbonyl,
2-iodoethoxycarbonyl, 2,2-difluoroethoxycarbonyl,
2,2,2-trifluoroethoxycarbonyl, 2-chloro-
2-fluoroethoxycarbonyl, 2-chloro-2,2-difluoroethoxycarbonyl,
2,2-dichloro-2-fluoroethoxycarbonyl,
2,2,2-trichloroethoxycarbonyl, pentafluoroethoxycarbonyl,
2-fluoropropoxycarbonyl, 3-fluoropropoxycarbonyl,
2-chloropropoxycarbonyl, 3-chloropropoxycarbonyl,
2-bromopropoxycarbonyl, 3-bromopropoxycarbonyl,
2,2-difluoropropoxycarbonyl, 2,3-difluoropropoxycarbonyl,
2,3-dichloropropoxycarbonyl, 3,3,3-trifluoropropoxycarbonyl,
3,3,3-trichloropropoxycarbonyl,

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40

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2,2,3,3,3-pentafluoropropoxycarbonyl,
 heptafluoropropoxycarbonyl,
 1-(fluoromethyl)-2-fluoroethoxycarbonyl,
 1-(chloromethyl)-2-chloroethoxycarbonyl,
 5 1-(bromomethyl)-2-bromethoxycarbonyl, 4-fluorobutoxycarbonyl,
 4-chlorobutoxycarbonyl, 4-bromobutoxycarbonyl,
 4-iodobutoxycarbonyl, 5-fluoropentoxycarbonyl,
 5-chloropentoxycarbonyl, 5-bromopentoxycarbonyl,
 6-fluorohexoxycarbonyl, 6-chlorohexoxycarbonyl or
 10 6-bromohexoxycarbonyl;

— (C₁—C₄—alkyl)carbonyloxy: acetyloxy, ethylcarbonyloxy,
 propylcarbonyloxy, 1-methylethylcarbonyloxy,
 butylcarbonyloxy, 1-methylpropylcarbonyloxy,
 15 2-methylpropylcarbonyloxy or 1,1-dimethylethylcarbonyloxy;

— (C₁—C₄—alkylamino)carbonyl: for example methylaminocarbonyl,
 ethylaminocarbonyl, propylaminocarbonyl,
 20 1-methylethylaminocarbonyl, butylaminocarbonyl,
 1-methylpropylaminocarbonyl, 2-methylpropylaminocarbonyl or
 1,1-dimethylethylaminocarbonyl;

— (C₁—C₆—alkylamino)carbonyl: (C₁—C₄—alkylamino)carbonyl, as
 25 mentioned above, and also, for example, pentylaminocarbonyl,
 1-methylbutylaminocarbonyl, 2-methylbutylaminocarbonyl,
 3-methylbutylaminocarbonyl, 2,2-dimethylpropylaminocarbonyl,
 1-ethylpropylaminocarbonyl, hexylaminocarbonyl,
 1,1-dimethylpropylaminocarbonyl,
 30 1,2-dimethylpropylaminocarbonyl, 1-methylpentylaminocarbonyl,
 2-methylpentylaminocarbonyl, 3-methylpentylaminocarbonyl,
 4-methylpentylaminocarbonyl, 1,1-dimethylbutylaminocarbonyl,
 1,2-dimethylbutylaminocarbonyl,
 1,3-dimethylbutylaminocarbonyl,
 35 2,2-dimethylbutylaminocarbonyl,
 2,3-dimethylbutylaminocarbonyl,
 3,3-dimethylbutylaminocarbonyl, 1-ethylbutylaminocarbonyl,
 2-ethylbutylaminocarbonyl,
 1,1,2-trimethylpropylaminocarbonyl,
 40 1,2,2-trimethylpropylaminocarbonyl,
 1-ethyl-1-methylpropylaminocarbonyl or
 1-ethyl-2-methylpropylaminocarbonyl;

— di-(C₁—C₄—alkyl)aminocarbonyl: for example
 45 N,N-dimethylaminocarbonyl, N,N-diethylaminocarbonyl,
 N,N-di-(1-methylethyl)aminocarbonyl,
 N,N-dipropylaminocarbonyl, N,N-dibutylaminocarbonyl,

N,N-di-(1-methylpropyl)aminocarbonyl,
 N,N-di-(2-methylpropyl)aminocarbonyl,
 N,N-di-(1,1-dimethylethyl)aminocarbonyl,
 N-ethyl-N-methylaminocarbonyl,
 5 N-methyl-N-propylaminocarbonyl,
 N-methyl-N-(1-methylethyl)aminocarbonyl,
 N-butyl-N-methylaminocarbonyl,
 N-methyl-N-(1-methylpropyl)aminocarbonyl,
 N-methyl-N-(2-methylpropyl)aminocarbonyl,
 10 N-(1,1-dimethylethyl)-N-methylaminocarbonyl,
 N-ethyl-N-propylaminocarbonyl,
 N-ethyl-N-(1-methylethyl)aminocarbonyl,
 N-butyl-N-ethylaminocarbonyl,
 N-ethyl-N-(1-methylpropyl)aminocarbonyl,
 15 N-ethyl-N-(2-methylpropyl)aminocarbonyl,
 N-ethyl-N-(1,1-dimethylethyl)aminocarbonyl,
 N-(1-methylethyl)-N-propylaminocarbonyl,
 N-butyl-N-propylaminocarbonyl,
 N-(1-methylpropyl)-N-propylaminocarbonyl,
 20 N-(2-methylpropyl)-N-propylaminocarbonyl,
 N-(1,1-dimethylethyl)-N-propylaminocarbonyl,
 N-butyl-N-(1-methylethyl)aminocarbonyl,
 N-(1-methylethyl)-N-(1-methylpropyl)aminocarbonyl,
 N-(1-methylethyl)-N-(2-methylpropyl)aminocarbonyl,
 25 N-(1,1-dimethylethyl)-N-(1-methylethyl)aminocarbonyl,
 N-butyl-N-(1-methylpropyl)aminocarbonyl,
 N-butyl-N-(2-methylpropyl)aminocarbonyl,
 N-butyl-N-(1,1-dimethylethyl)aminocarbonyl,
 N-(1-methylpropyl)-N-(2-methylpropyl)aminocarbonyl,
 30 N-(1,1-dimethylethyl)-N-(1-methylpropyl)aminocarbonyl or
 N-(1,1-dimethylethyl)-N-(2-methylpropyl)aminocarbonyl;

 - di-(C₁-C₆-alkyl)aminocarbonyl: di-(C₁-C₄-alkyl)aminocarbonyl,
 as mentioned above, and also, for example,
 35 N-methyl-N-pentylaminocarbonyl,
 N-methyl-N-(1-methylbutyl)aminocarbonyl,
 N-methyl-N-(2-methylbutyl)aminocarbonyl,
 N-methyl-N-(3-methylbutyl)aminocarbonyl, N-methyl-N-(2,2-dimethylpropyl)aminocarbonyl,
 40 N-methyl-N-(1-ethylpropyl)aminocarbonyl,
 N-methyl-N-hexylaminocarbonyl,
 N-methyl-N-(1,1-dimethylpropyl)aminocarbonyl, N-methyl-N-(1,2-dimethylpropyl)aminocarbonyl,
 N-methyl-N-(1-methylpentyl)aminocarbonyl,
 45 N-methyl-N-(2-methylpentyl)aminocarbonyl,
 N-methyl-N-(3-methylpentyl)aminocarbonyl,
 N-methyl-N-(4-methylpentyl)aminocarbonyl, N-methyl-N-

(1,1-dimethylbutyl)aminocarbonyl,
 N-methyl-N-(1,2-dimethylbutyl)aminocarbonyl,
 N-methyl-N-(1,3-dimethylbutyl)aminocarbonyl,
 N-methyl-N-(2,2-dimethylbutyl)aminocarbonyl,
 5 N-methyl-N-(2,3-dimethylbutyl)aminocarbonyl, N-methyl-N-(3,3-dimethylbutyl)aminocarbonyl,
 N-methyl-N-(1-ethylbutyl)aminocarbonyl,
 N-methyl-N-(2-ethylbutyl)aminocarbonyl,
 N-methyl-N-(1,1,2-trimethylpropyl)aminocarbonyl,
 10 N-methyl-N-(1,2,2-trimethylpropyl)aminocarbonyl, N-methyl-N-(1-ethyl-1-methylpropyl)aminocarbonyl, N-methyl-N-(1-ethyl-2-methylpropyl)aminocarbonyl,
 N-ethyl-N-pentylaminocarbonyl,
 N-ethyl-N-(1-methylbutyl)aminocarbonyl, N-ethyl-
 15 N-(2-methylbutyl)aminocarbonyl,
 N-ethyl-N-(3-methylbutyl)aminocarbonyl,
 N-ethyl-N-(2,2-dimethylpropyl)aminocarbonyl,
 N-ethyl-N-(1-ethylpropyl)aminocarbonyl,
 N-ethyl-N-hexylaminocarbonyl,
 20 N-ethyl-N-(1,1-dimethylpropyl)aminocarbonyl,
 N-ethyl-N-(1,2-dimethylpropyl)aminocarbonyl,
 N-ethyl-N-(1-methylpentyl)aminocarbonyl,
 N-ethyl-N-(2-methylpentyl)aminocarbonyl,
 N-ethyl-N-(3-methylpentyl)aminocarbonyl,
 25 N-ethyl-N-(4-methylpentyl)aminocarbonyl,
 N-ethyl-N-(1,1-dimethylbutyl)aminocarbonyl,
 N-ethyl-N-(1,2-dimethylbutyl)aminocarbonyl,
 N-ethyl-N-(1,3-dimethylbutyl)aminocarbonyl,
 N-ethyl-N-(2,2-dimethylbutyl)aminocarbonyl, N-ethyl-N-(2,3-
 30 dimethylbutyl)aminocarbonyl,
 N-ethyl-N-(3,3-dimethylbutyl)aminocarbonyl,
 N-ethyl-N-(1-ethylbutyl)aminocarbonyl,
 N-ethyl-N-(2-ethylbutyl)aminocarbonyl,
 N-ethyl-N-(1,1,2-trimethylpropyl)aminocarbonyl,
 35 N-ethyl-N-(1,2,2-trimethylpropyl)aminocarbonyl,
 N-ethyl-N-(1-ethyl-1-methylpropyl)aminocarbonyl,
 N-ethyl-N-(1-ethyl-2-methylpropyl)aminocarbonyl,
 N-Propyl-N-pentylaminocarbonyl,
 N-butyl-N-pentylaminocarbonyl, N,N-dipentylaminocarbonyl,
 40 N-Propyl-N-hexylaminocarbonyl, N-butyl-N-hexylaminocarbonyl,
 N-pentyl-N-hexylaminocarbonyl or N,N-dihexylaminocarbonyl;

 - di-(C₁-C₆-alkyl)aminothiocarbonyl: for example
 45 N,N-dimethylaminothiocarbonyl, N,N-diethylaminothiocarbonyl,
 N,N-di-(1-methylethyl)aminothiocarbonyl,
 N,N-dipropylaminothiocarbonyl, N,N-dibutylaminothiocarbonyl,
 N,N-di-(1-methylpropyl)aminothiocarbonyl,

N,N-di-(2-methylpropyl)aminothiocarbonyl,
 N,N-di-(1,1-dimethylethyl)aminothiocarbonyl,
 N-ethyl-N-methylaminothiocarbonyl,
 N-methyl-N-propylaminothiocarbonyl,
 5 N-methyl-N-(1-methylethyl)aminothiocarbonyl,
 N-butyl-N-methylaminothiocarbonyl,
 N-methyl-N-(1-methylpropyl)aminothiocarbonyl,
 N-methyl-N-(2-methylpropyl)aminothiocarbonyl,
 N-(1,1-dimethylethyl)-N-methylaminothiocarbonyl,
 10 N-ethyl-N-propylaminothiocarbonyl,
 N-ethyl-N-(1-methylethyl)aminothiocarbonyl,
 N-butyl-N-ethylaminothiocarbonyl,
 N-ethyl-N-(1-methylpropyl)aminothiocarbonyl,
 N-ethyl-N-(2-methylpropyl)-aminothiocarbonyl, N-ethyl-N-
 15 (1,1-dimethylethyl)-aminothiocarbonyl, N-(1-methylethyl)-
 N-propylaminothiocarbonyl, N-butyl-N-propylaminothiocarbonyl,
 N-(1-methylpropyl)-N-propylaminothiocarbonyl,
 N-(2-methylpropyl)-N-propylaminothiocarbonyl,
 N-(1,1-dimethylethyl)-N-propylaminothiocarbonyl,
 20 N-butyl-N-(1-methylethyl)aminothiocarbonyl,
 N-(1-methylethyl)-N-(1-methylpropyl)aminothiocarbonyl,
 N-(1-methylethyl)-N-(2-methylpropyl)aminothiocarbonyl,
 N-(1,1-dimethylethyl)-N-(1-methylethyl)aminothiocarbonyl,
 N-butyl-N-(1-methylpropyl)aminothiocarbonyl,
 25 N-butyl-N-(2-methylpropyl)aminothiocarbonyl, N-butyl-N-
 (1,1-dimethylethyl)aminothiocarbonyl, N-(1-methylpropyl)-
 N-(2-methylpropyl)aminothiocarbonyl,
 N-(1,1-dimethylethyl)-N-(1-methylpropyl)aminothiocarbonyl,
 N-(1,1-dimethylethyl)-N-(2-methylpropyl)aminothiocarbonyl,
 30 N-methyl-N-pentylaminothiocarbonyl,
 N-methyl-N-(1-methylbutyl)aminothiocarbonyl,
 N-methyl-N-(2-methylbutyl)aminothiocarbonyl,
 N-methyl-N-(3-methylbutyl)aminothiocarbonyl, N-methyl-N-
 (2,2-dimethylpropyl)aminothiocarbonyl,
 35 N-methyl-N-(1-ethylpropyl)aminothiocarbonyl,
 N-methyl-N-hexylaminothiocarbonyl,
 N-methyl-N-(1,1-dimethylpropyl)aminothiocarbonyl, N-methyl-
 N-(1,2-dimethylpropyl)aminothiocarbonyl, N-methyl-N-
 (1-methylpentyl)aminothiocarbonyl,
 40 N-methyl-N-(2-methylpentyl)aminothiocarbonyl,
 N-methyl-N-(3-methylpentyl)aminothiocarbonyl,
 N-methyl-N-(4-methylpentyl)aminothiocarbonyl,
 N-methyl-N-(1,1-dimethylbutyl)aminothiocarbonyl, N-methyl-
 N-(1,2-dimethylbutyl)aminothiocarbonyl,
 45 N-methyl-N-(1,3-dimethylbutyl)aminothiocarbonyl,
 N-methyl-N-(2,2-dimethylbutyl)aminothiocarbonyl,
 N-methyl-N-(2,3-dimethylbutyl)aminothiocarbonyl,

N-methyl-N-(3,3-dimethylbutyl)aminothiocarbonyl,
 N-methyl-N-(1-ethylbutyl)aminothiocarbonyl,
 N-methyl-N-(2-ethylbutyl)aminothiocarbonyl, N-methyl-N-ethyl-
 N-(1,1,2-trimethylpropyl)aminothiocarbonyl, N-methyl-N-
 5 (1,2,2-trimethylpropyl)aminothiocarbonyl, N-methyl-N-(1-
 ethyl-1-methylpropyl)aminothiocarbonyl, N-methyl-N-(1-ethyl-
 2-methylpropyl)aminothiocarbonyl,
 N-ethyl-N-pentylaminothiocarbonyl,
 N-ethyl-N-(1-methylbutyl)aminothiocarbonyl,
 10 N-ethyl-N-(2-methylbutyl)aminothiocarbonyl, N-ethyl-N-(3-
 methylbutyl)aminothiocarbonyl,
 N-ethyl-N-(2,2-dimethylpropyl)aminothiocarbonyl,
 N-ethyl-N-(1-ethylpropyl)aminothiocarbonyl,
 N-ethyl-N-hexylaminothiocarbonyl, N-ethyl-N-
 15 (1,1-dimethylpropyl)aminothiocarbonyl, N-ethyl-N-(1,2-
 dimethylpropyl)aminothiocarbonyl,
 N-ethyl-N-(1-methylpentyl)aminothiocarbonyl,
 N-ethyl-N-(2-methylpentyl)aminothiocarbonyl,
 N-ethyl-N-(3-methylpentyl)aminothiocarbonyl,
 20 N-ethyl-N-(4-methylpentyl)aminothiocarbonyl, N-ethyl-N-
 (1,1-dimethylbutyl)aminothiocarbonyl, N-ethyl-N-(1,2-
 dimethylbutyl)aminothiocarbonyl,
 N-ethyl-N-(1,3-dimethylbutyl)aminothiocarbonyl,
 N-ethyl-N-(2,2-dimethylbutyl)aminothiocarbonyl,
 25 N-ethyl-N-(2,3-dimethylbutyl)aminothiocarbonyl,
 N-ethyl-N-(3,3-dimethylbutyl)aminothiocarbonyl,
 N-ethyl-N-(1-ethylbutyl)aminothiocarbonyl, N-ethyl-N-(2-
 ethylbutyl)aminothiocarbonyl,
 N-ethyl-N-(1,1,2-trimethylpropyl)aminothiocarbonyl,
 30 N-ethyl-N-(1,2,2-trimethylpropyl)aminothiocarbonyl,
 N-ethyl-N-(1-ethyl-1-methylpropyl)aminothiocarbonyl,
 N-ethyl-N-(1-ethyl-2-methylpropyl)aminothiocarbonyl,
 N-Propyl-N-pentylaminothiocarbonyl,
 N-butyl-N-pentylaminothiocarbonyl,
 35 N,N-dipentylaminothiocarbonyl,
 N-Propyl-N-hexylaminothiocarbonyl,
 N-butyl-N-hexylaminothiocarbonyl,
 N-pentyl-N-hexylaminothiocarbonyl or
 N,N-dihexylaminothiocarbonyl;
 40 - C₁-C₄-alkoxy-C₁-C₄-alkyl: C₁-C₄-alkyl which is substituted by
 C₁-C₄-alkoxy as mentioned above, i.e., for example,
 methoxymethyl, ethoxymethyl, propoxymethyl,
 (1-methylethoxy)methyl, butoxymethyl,
 45 (1-methylpropoxy)methyl, (2-methylpropoxy)methyl,
 (1,1-dimethylethoxy)methyl, 2-(methoxy)ethyl,
 2-(ethoxy)ethyl, 2-(propoxy)ethyl, 2-(1-methylethoxy)ethyl,

25

2-(butoxy)ethyl, 2-(1-methylpropoxy)ethyl,
 2-(2-methylpropoxy)ethyl, 2-(1,1-dimethylethoxy)ethyl,
 2-(methoxy)-propyl, 2-(ethoxy)propyl, 2-(propoxy)propyl,
 2-(1-methylethoxy)propyl, 2-(butoxy)propyl,
 5 2-(1-methylpropoxy)propyl, 2-(2-methylpropoxy)propyl,
 2-(1,1-dimethylethoxy)propyl, 3-(methoxy)propyl,
 3-(ethoxy)propyl, 3-(propoxy)propyl,
 3-(1-methylethoxy)propyl, 3-(butoxy)propyl,
 3-(1-methylpropoxy)propyl, 3-(2-methylpropoxy)propyl,
 10 3-(1,1-dimethylethoxy)propyl, 2-(methoxy)butyl,
 2-(ethoxy)butyl, 2-(propoxy)butyl, 2-(1-methylethoxy)butyl,
 2-(butoxy)butyl, 2-(1-methylpropoxy)butyl,
 2-(2-methylpropoxy)butyl, 2-(1,1-dimethylethoxy)butyl,
 3-(methoxy)butyl, 3-(ethoxy)butyl, 3-(propoxy)butyl,
 15 3-(1-methylethoxy)butyl, 3-(butoxy)butyl,
 3-(1-methylpropoxy)butyl, 3-(2-methylpropoxy)butyl,
 3-(1,1-dimethylethoxy)butyl, 4-(methoxy)butyl, 4-(ethoxy)-
 butyl, 4-(propoxy)butyl, 4-(1-methylethoxy)butyl,
 4-(butoxy)butyl, 4-(1-methylpropoxy)butyl,
 20 4-(2-methylpropoxy)butyl or 4-(1,1-dimethylethoxy)butyl;

 - C₁-C₄-alkoxy-C₁-C₄-alkoxy, and the alkoxyalkoxy moieties of
 C₁-C₄-alkoxy-C₁-C₄-alkoxycarbonyl: C₁-C₄-alkoxy which is
 25 substituted by C₁-C₄-alkoxy as mentioned above, i.e., for
 example, methoxymethoxy, ethoxymethoxy, propoxymethoxy,
 (1-methylethoxy)methoxy, butoxymethoxy,
 (1-methylpropoxy)methoxy, (2-methylpropoxy)methoxy,
 (1,1-dimethylethoxy)methoxy, 2-(methoxy)ethoxy,
 30 2-(ethoxy)ethoxy, 2-(propoxy)ethoxy,
 2-(1-methylethoxy)ethoxy, 2-(butoxy)ethoxy,
 2-(1-methylpropoxy)ethoxy, 2-(2-methylpropoxy)ethoxy,
 2-(1,1-dimethylethoxy)ethoxy, 2-(methoxy)propoxy,
 2-(ethoxy)propoxy, 2-(propoxy)propoxy,
 35 2-(1-methylethoxy)propoxy, 2-(butoxy)propoxy,
 2-(1-methylpropoxy)propoxy, 2-(2-methylpropoxy)propoxy,
 2-(1,1-dimethylethoxy)propoxy, 3-(methoxy)propoxy,
 3-(ethoxy)propoxy, 3-(propoxy)propoxy, 3-(1-methylethoxy)-
 propoxy, 3-(butoxy)propoxy, 3-(1-methylpropoxy)propoxy,
 40 3-(2-methylpropoxy)propoxy, 3-(1,1-dimethylethoxy)propoxy,
 2-(methoxy)butoxy, 2-(ethoxy)butoxy, 2-(propoxy)butoxy,
 2-(1-methylethoxy)butoxy, 2-(butoxy)butoxy,
 2-(1-methylpropoxy)butoxy, 2-(2-methylpropoxy)butoxy,
 2-(1,1-dimethylethoxy)butoxy, 3-(methoxy)butoxy,
 45 3-(ethoxy)butoxy, 3-(propoxy)butoxy,
 3-(1-methylethoxy)butoxy, 3-(butoxy)butoxy,
 3-(1-methylpropoxy)butoxy, 3-(2-methylpropoxy)butoxy,
 3-(1,1-dimethylethoxy)butoxy, 4-(methoxy)butoxy,

4-(ethoxy)butoxy, 4-(propoxy)butoxy,
 4-(1-methylethoxy)butoxy, 4-(butoxy)butoxy,
 4-(1-methylpropoxy)butoxy, 4-(2-methylpropoxy)butoxy or
 4-(1,1-dimethylethoxy)butoxy;

5

- C_3-C_6 -alkenyl, and the alkenyl moieties of
 C_3-C_6 -alkenylcarbonyl, C_3-C_6 -alkenyloxy,
 C_3-C_6 -alkenyloxycarbonyl, C_3-C_6 -alkenylaminocarbonyl,
 $N-(C_3-C_6\text{-alkenyl})-N-(C_1-C_6\text{alkyl})\text{aminocarbonyl}$,

10 $N-(C_3-C_6\text{-alkenyl})-N-(C_1-C_6\text{-alkoxy})\text{aminocarbonyl}$: for example
 prop-2-en-1-yl, but-1-en-4-yl, 1-methyl-prop-2-en-1-yl,
 2-methylprop-2-en-1-yl, 2-buten-1-yl, 1-penten-3-yl,
 1-penten-4-yl, 2-penten-4-yl, 1-methylbut-2-en-1-yl,
 2-methylbut-2-en-1-yl, 3-methylbut-2-en-1-yl,

15 1-methylbut-3-en-1-yl, 2-methylbut-3-en-1-yl,
 3-methylbut-3-en-1-yl, 1,1-dimethylprop-2-en-1-yl,
 1,2-dimethylprop-2-en-1-yl, 1-ethylprop-2-en-1-yl,
 hex-3-en-1-yl, hex-4-en-1-yl, hex-5-en-1-yl,
 1-methylpent-3-en-1-yl, 2-methylpent-3-en-1-yl,

20 3-methylpent-3-en-1-yl, 4-methylpent-3-en-1-yl,
 1-methylpent-4-en-1-yl, 2-methylpent-4-en-1-yl,
 3-methylpent-4-en-1-yl, 4-methylpent-4-en-1-yl,
 1,1-dimethylbut-2-en-1-yl, 1,1-dimethylbut-3-en-1-yl,
 1,2-dimethylbut-2-en-1-yl, 1,2-dimethylbut-3-en-1-yl,

25 1,3-dimethylbut-2-en-1-yl, 1,3-dimethylbut-3-en-1-yl,
 2,2-dimethylbut-3-en-1-yl, 2,3-dimethylbut-2-en-1-yl,
 2,3-dimethylbut-3-en-1-yl, 3,3-dimethylbut-2-en-1-yl,
 1-ethylbut-2-en-1-yl, 1-ethylbut-3-en-1-yl,
 2-ethylbut-2-en-1-yl, 2-ethylbut-3-en-1-yl,

30 1,1,2-trimethylprop-2-en-1-yl, 1-ethyl-1-methylprop-2-en-1-yl
 or 1-ethyl-2-methylprop-2-en-1-yl;

C_2-C_6 -alkenyl, and the alkenyl moieties of
 C_2-C_6 -alkenylcarbonyl, phenyl- C_2-C_6 -alkenylcarbonyl and
 heterocyclyl- C_2-C_6 -alkenylcarbonyl: C_3-C_6 -alkenyl as mentioned
 above, and also ethenyl;

- C_3-C_6 -haloalkenyl: a C_3-C_6 -alkenyl radical as mentioned above
 40 which is partially or fully substituted by fluorine,
 chlorine, bromine and/or iodine, i.e., for example,
 2-chloroallyl, 3-chloroallyl, 2,3-dichloroallyl,
 3,3-dichloroallyl, 2,3,3-trichloroallyl,
 2,3-dichlorobut-2-enyl, 2-bromoallyl, 3-bromoallyl,
 45 2,3-dibromoallyl, 3,3-dibromoallyl, 2,3,3-tribromoallyl or
 2,3-dibromobut-2-enyl;

- C_3-C_6 -alkynyl, and the alkynyl moieties of C_3-C_6 -alkynylcarbonyl, C_3-C_6 -alkynylloxy, C_3-C_6 -alkynylloxycarbonyl, C_3-C_6 -alkynylaminocarbonyl, $N-(C_3-C_6\text{-alkynyl})-N-(C_1-C_6\text{-alkyl})\text{aminocarbonyl}$,
- 5 $N-(C_3-C_6\text{-alkynyl})-N-(C_1-C_6\text{-alkoxyaminocarbonyl}$: for example propargyl, but-1-yn-3-yl, but-1-yn-4-yl, but-2-yn-1-yl, pent-1-yn-3-yl, pent-1-yn-4-yl, pent-1-yn-5-yl, pent-2-yn-1-yl, pent-2-yn-4-yl, pent-2-yn-5-yl, 3-methyl-but-1-yn-3-yl, 3-methylbut-1-yn-4-yl, hex-1-yn-3-yl, hex-1-yn-4-yl, hex-1-yn-5-yl, hex-1-yn-6-yl, hex-2-yn-1-yl, hex-2-yn-4-yl, hex-2-yn-5-yl, hex-2-yn-6-yl, hex-3-yn-1-yl, hex-3-yn-2-yl, 3-methylpent-1-yn-3-yl, 3-methylpent-1-yn-4-yl, 3-methylpent-1-yn-5-yl, 4-methylpent-2-yn-4-yl or 4-methylpent-2-yn-5-yl;
- 10
- 15
- C_2-C_6 -alkynyl, and the alkynyl moieties of C_2-C_6 -alkynylcarbonyl: C_3-C_6 -alkynyl as mentioned above, and also ethynyl;
- 20
- C_3-C_6 -haloalkynyl: a C_3-C_6 -alkynyl radical as mentioned above which is partially or fully substituted by fluorine, chlorine, bromine and/or iodine, i.e., for example, 1,1-difluoroprop-2-yn-1-yl, 3-iodoprop-2-yn-1-yl, 4-fluorobut-2-yn-1-yl, 4-chlorobut-2-yn-1-yl, 25 1,1-difluorobut-2-yn-1-yl, 4-iodobut-3-yn-1-yl, 5-fluoropent-3-yn-1-yl, 5-iodopent-4-yn-1-yl, 6-fluorohex-4-yn-1-yl or 6-iodohex-5-yn-1-yl;
- 30
- C_3-C_6 -cycloalkyl, and the cycloalkyl moieties of C_3-C_6 -cycloalkylcarbonyl: for example cyclopropyl, cyclobutyl, cyclopentyl or cyclohexyl;
- 35
- heterocyclyl, and the heterocyclyl moieties of heterocyclylcarbonyl, heterocyclyl- C_1-C_6 -alkyl, heterocycloloxy, heterocyclylthio, heterocycloloxyalkylcarbonyl, heterocycloloxyloxycarbonyl, heterocycloloxythiocarbonyl, heterocyclylcarbonyl- C_1-C_6 -alkyl, $N-(C_1-C_6\text{-alkyl})-N-(\text{heterocyclyl})\text{aminocarbonyl}$,
- 40
- heterocyclylaminocarbonyl: a saturated, partially saturated or unsaturated 5- or 6-membered heterocyclic ring which is attached via a carbon and has one to four identical or different hetero atoms selected from the following group: oxygen, sulfur or nitrogen, i.e., for example, 5-membered 45 rings having a hetero atom such as, for example:

tetrahydrofuran-2-yl, tetrahydrofuran-3-yl, tetrahydrothien-
 2-yl, tetrahydrothien-3-yl, tetrahydropyrrol-2-yl,
 tetrahydropyrrol-3-yl, 2,3-dihydrofuran-2-yl,
 2,3-dihydrofuran-3-yl, 2,5-dihydrofuran-2-yl,
 5 2,5-dihydrofuran-3-yl, 4,5-dihydrofuran-2-yl,
 4,5-dihydrofuran-3-yl, 2,3-dihydrothien-2-yl,
 2,3-dihydrothien-3-yl, 2,5-dihydrothien-2-yl,
 2,5-dihydrothien-3-yl, 4,5-dihydrothien-2-yl,
 4,5-dihydrothien-3-yl, 2,3-dihydro-1H-pyrrol-2-yl,
 10 2,3-dihydro-1H-pyrrol-3-yl, 2,5-dihydro-1H-pyrrol-2-yl,
 2,5-dihydro-1H-pyrrol-3-yl, 4,5-dihydro-1H-pyrrol-2-yl,
 4,5-dihydro-1H-pyrrol-3-yl, 3,4-dihydro-2H-pyrrol-2-yl,
 3,4-dihydro-2H-pyrrol-3-yl, 3,4-dihydro-5H-pyrrol-2-yl,
 3,4-dihydro-5H-pyrrol-3-yl, 2-furyl, 3-furyl, 2-thienyl,
 15 3-thienyl, pyrrol-2-yl or pyrrol-3-yl;

5-membered rings having two hetero atoms such as, for example,

20 tetrahydropyrazol-3-yl, tetrahydropyrazol-3-yl,
 tetrahydropyrazol-4-yl, tetrahydroisoxazol-3-yl,
 tetrahydroisoxazol-4-yl, tetrahydroisoxazol-5-yl,
 1,2-oxathiolan-3-yl, 1,2-oxathiolan-4-yl,
 1,2-oxathiolan-5-yl, tetrahydroisothiazol-3-yl,
 25 tetrahydroisothiazol-4-yl, tetrahydroisothiazol-5-yl,
 1,2-dithiolan-3-yl, 1,2-dithiolan-4-yl,
 tetrahydroimidazol-2-yl, tetrahydroimidazol-4-yl,
 tetrahydrooxazol-2-yl, tetrahydrooxazol-4-yl,
 30 tetrahydrooxazol-5-yl, tetrahydrothiazol-2-yl,
 tetrahydrothiazol-4-yl, tetrahydrothiazol-5-yl,
 1,3-dioxolan-2-yl, 1,3-dioxolan-4-yl, 1,3-oxathiolan-2-yl,
 1,3-oxathiolan-4-yl, 1,3-oxathiolan-5-yl, 1,3-dithiolan-2-yl,
 1,3-dithiolan-4-yl, 4,5-dihydro-1H-pyrazol-3-yl,
 35 4,5-dihydro-1H-pyrazol-4-yl, 4,5-dihydro-1H-pyrazol-5-yl,
 2,5-dihydro-1H-pyrazol-3-yl, 2,5-dihydro-1H-pyrazol-4-yl,
 2,5-dihydro-1H-pyrazol-5-yl, 4,5-dihydroisoxazol-3-yl,
 4,5-dihydroisoxazol-4-yl, 4,5-dihydroisoxazol-5-yl,
 2,5-dihydroisoxazol-3-yl, 2,5-dihydroisoxazol-4-yl,
 40 2,5-dihydroisoxazol-5-yl, 2,3-dihydroisoxazol-3-yl,
 2,3-dihydroisoxazol-4-yl, 2,3-dihydroisoxazol-5-yl,
 4,5-dihydroisothiazol-3-yl, 4,5-dihydroisothiazol-4-yl,
 4,5-dihydroisothiazol-5-yl, 2,5-dihydroisothiazol-3-yl,
 2,5-dihydroisothiazol-4-yl, 2,5-dihydroisothiazol-5-yl,
 45 2,3-dihydroisothiazol-3-yl, 2,3-dihydroisothiazol-4-yl,
 2,3-dihydroisothiazol-
 5-yl, Δ^3 -1,2-dithiol-3-yl, Δ^3 -1,2-dithiol-4-yl,
 Δ^3 -1,2-dithiol-5-yl, 4,5-dihydro-1H-imidazol-2-yl,

4,5-dihydro-1H-imidazol-4-yl, 4,5-dihydro-1H-imidazol-5-yl,
 2,5-dihydro-1H-imidazol-2-yl, 2,5-dihydro-1H-imidazol-4-yl,
 2,5-dihydro-1H-imidazol-5-yl, 2,3-dihydro-1H-imidazol-2-yl,
 2,3-dihydro-1H-imidazol-4-yl, 4,5-dihydrooxazol-2-yl,
 5 4,5-dihydrooxazol-4-yl, 4,5-dihydrooxazol-5-yl,
 2,5-dihydrooxazol-2-yl, 2,5-dihydrooxazol-4-yl,
 2,5-dihydrooxazol-5-yl, 2,3-dihydrooxazol-2-yl,
 2,3-dihydrooxazol-4-yl, 2,3-dihydrooxazol-5-yl,
 4,5-dihydrothiazol-2-yl, 4,5-dihydrothiazol-4-yl,
 10 4,5-dihydrothiazol-5-yl, 2,5-dihydrothiazol-2-yl,
 2,5-dihydrothiazol-4-yl, 2,5-dihydrothiazol-5-yl,
 2,3-dihydrothiazol-2-yl, 2,3-dihydrothiazol-4-yl,
 2,3-dihydrothiazol-5-yl, 1,3-dioxol-2-yl, 1,3-dioxol-4-yl,
 1,3-dithiol-2-yl, 1,3-dithiol-4-yl, 1,3-oxathiol-2-yl,
 15 1,3-oxathiol-4-yl, 1,3-oxathiol-5-yl, pyrazol-3-yl,
 pyrazol-4-yl, isoxazol-3-yl, isoxazol-4-yl, isoxazol-5-yl,
 isothiazol-3-yl, isothiazol-4-yl, isothiazol-5-yl,
 imidazol-2-yl, imidazol-4-yl, oxazol-2-yl, oxazol-4-yl,
 oxazol-5-yl, thiazol-2-yl, thiazol-4-yl or thiazol-5-yl;
 20

5-membered rings having 3 hetero atoms such as, for example,
 1,2,3- Δ^2 -oxadiazolin-4-yl, 1,2,3- Δ^2 -oxadiazolin-5-yl,
 1,2,4- Δ^4 -oxadiazolin-3-yl, 1,2,4- Δ^4 -oxadiazolin-5-yl,
 25 1,2,4- Δ^2 -oxadiazolin-3-yl, 1,2,4- Δ^2 -oxadiazolin-5-yl,
 1,2,4- Δ^3 -oxadiazolin-3-yl, 1,2,4- Δ^3 -oxadiazolin-5-yl,
 1,3,4- Δ^2 -oxadiazolin-2-yl, 1,3,4- Δ^2 -oxadiazolin-5-yl,
 1,3,4- Δ^3 -oxadiazolin-2-yl, 1,3,4-oxadiazolin-2-yl,
 1,2,4- Δ^4 -thiadiazolin-3-yl, 1,2,4- Δ^4 -thiadiazolin-5-yl,
 30 1,2,4- Δ^3 -thiadiazolin-3-yl, 1,2,4- Δ^3 -thiadiazolin-5-yl,
 1,2,4- Δ^2 -thiadiazolin-3-yl, 1,2,4- Δ^2 -thiadiazolin-5-yl,
 1,3,4- Δ^2 -thiadiazolin-2-yl, 1,3,4- Δ^2 -thiadiazolin-5-yl,
 1,3,4- Δ^3 -thiadiazolin-2-yl, 1,3,4-thiadiazolin-2-yl,
 1,3,2-dioxathiolan-4-yl, 1,2,3- Δ^2 -triazolin-4-yl,
 35 1,2,3- Δ^2 -triazolin-5-yl, 1,2,4- Δ^2 -triazolin-3-yl,
 1,2,4- Δ^2 -triazolin-5-yl, 1,2,4- Δ^3 -triazolin-3-yl,
 1,2,4- Δ^3 -triazolin-5-yl, 1,2,4- Δ^1 -triazolin-2-yl,
 1,2,4-triazolin-3-yl, 3H-1,2,4-dithiazol-5-yl,
 2H-1,3,4-dithiazol-5-yl, 2H-1,3,4-oxathiazol-5-yl,
 40 1,2,3-oxadiazol-4-yl, 1,2,3-oxadiazol-5-yl,
 1,2,4-oxadiazol-3-yl, 1,2,4-oxadiazol-5-yl,
 1,3,4-oxadiazol-2-yl, 1,2,3-thiadiazol-4-yl,
 1,2,3-thiadiazol-5-yl, 1,2,4-thiadiazol-3-yl,
 1,2,4-thiadiazol-5-yl, 1,3,4-thiadiazolyl-2-yl,
 45 1,2,3-triazol-4-yl or 1,2,4-triazol-3-yl;

5-membered rings having 4 hetero atoms such as, for example,

tetrazol-5-yl,

6-membered rings having 1 hetero atom such as, for example:

5 tetrahydropyran-2-yl, tetrahydropyran-3-yl,
 10 tetrahydropyran-4-yl, piperidin-2-yl, piperidin-3-yl,
 15 piperidin-4-yl, tetrahydrothiopyran-2-yl,
 20 tetrahydrothiopyran-3-yl, tetrahydrothiopyran-4-yl,
 25 2H-3,4-dihydropyran-6-yl, 2H-3,4-dihydropyran-5-yl,
 30 2H-3,4-dihydropyran-4-yl, 2H-3,4-dihydropyran-3-yl,
 35 2H-3,4-dihydropyran-2-yl, 2H-3,4-dihydropyran-6-yl,
 40 2H-3,4-dihydrothiopyran-5-yl, 2H-3,4-dihydrothiopyran-4-yl,
 45 2H-3,4-dihydropyran-3-yl, 2H-3,4-dihydropyran-2-yl,
 50 1,2,3,4-tetrahydropyridin-6-yl,
 55 1,2,3,4-tetrahydropyridin-5-yl, 1,2,3,4-tetrahydropyridin-4-
 60 yl, 1,2,3,4-tetrahydropyridin-3-yl,
 65 1,2,3,4-tetrahydropyridin-2-yl, 2H-5,6-dihydropyran-2-yl,
 70 2H-5,6-dihydropyran-3-yl, 2H-5,6-dihydropyran-4-yl,
 75 2H-5,6-dihydropyran-5-yl, 2H-5,6-dihydropyran-6-yl,
 80 2H-5,6-dihydrothiopyran-2-yl, 2H-5,6-dihydrothiopyran-3-yl,
 85 2H-5,6-dihydrothiopyran-4-yl, 2H-5,6-dihydrothiopyran-5-yl,
 90 2H-5,6-dihydrothiopyran-6-yl, 1,2,5,6-tetrahydropyridin-2-yl,
 95 1,2,5,6-tetrahydropyridin-3-yl, 1,2,5,6-tetrahydro-
 100 pyridin-4-yl, 1,2,5,6-tetrahydropyridin-5-yl, 1,2,5,6-
 105 tetrahydropyridin-6-yl, 2,3,4,5-tetrahydropyridin-2-yl,
 110 2,3,4,5-tetrahydropyridin-3-yl, 2,3,4,5-tetra-
 115 hydropyridin-4-yl, 2,3,4,5-tetrahydropyridin-5-yl,
 120 2,3,4,5-tetrahydropyridin-6-yl, 4H-pyran-2-yl, 4H-pyran-3-yl,
 125 4H-pyran-4-yl, 4H-thiopyran-2-yl, 4H-thiopyran-3-yl,
 130 4H-thiopyran-4-yl, 1,4-dihydropyridin-2-yl,
 135 1,4-dihydropyridin-3-yl, 1,4-dihydropyridin-4-yl,
 140 2H-pyran-2-yl, 2H-pyran-3-yl, 2H-pyran-4-yl, 2H-pyran-5-yl,
 145 2H-pyran-6-yl, 2H-thiopyran-2-yl, 2H-thiopyran-3-yl,
 150 2H-thiopyran-4-yl, 2H-thiopyran-5-yl, 2H-thiopyran-6-yl,
 155 1,2-dihydropyridin-2-yl, 1,2-dihydropyridin-3-yl,
 160 1,2-dihydropyridin-4-yl, 1,2-dihydropyridin-5-yl,
 165 1,2-dihydropyridin-6-yl, 3,4-dihydropyridin-2-yl,
 170 3,4-dihydropyridin-3-yl, 3,4-dihydropyridin-4-yl,
 175 3,4-dihydropyridin-5-yl, 3,4-dihydropyridin-6-yl,
 180 2,5-dihydropyridin-2-yl, 2,5-dihydropyridin-3-yl,
 185 2,5-dihydropyridin-4-yl, 2,5-dihydropyridin-5-yl,
 190 2,5-dihydropyridin-6-yl, 2,3-dihydropyridin-2-yl,
 195 2,3-dihydropyridin-3-yl, 2,3-dihydropyridin-4-yl,
 200 2,3-dihydropyridin-5-yl, 2,3-dihydropyridin-6-yl,
 205 pyridin-2-yl, pyridin-3-yl or pyridin-4-yl;

6-membered rings having 2 hetero atoms such as, for example,

1,3-dioxan-2-yl, 1,3-dioxan-4-yl, 1,3-dioxan-5-yl,
 1,4-dioxan-2-yl, 1,3-dithian-2-yl, 1,3-dithian-4-yl,
 5 1,3-dithian-5-yl, 1,4-dithian-2-yl, 1,3-oxathian-2-yl,
 1,3-oxathian-4-yl, 1,3-oxathian-5-yl, 1,3-oxathian-6-yl,
 1,4-oxathian-2-yl, 1,4-oxathian-3-yl, 1,2-dithian-3-yl,
 1,2-dithian-4-yl, hexahydropyrimidin-2-yl,
 10 hexahydropyrimidin-4-yl, hexahydropyrimidin-5-yl,
 hexahydropyrazin-2-yl, hexahydropyridazin-3-yl,
 hexahydropyridazin-4-yl, tetrahydro-1,3-oxazin-2-yl,
 tetrahydro-1,3-oxazin-4-yl, tetrahydro-1,3-oxazin-5-yl,
 tetrahydro-1,3-oxazin-6-yl, tetrahydro-1,3-thiazin-2-yl,
 15 tetrahydro-1,3-thiazin-4-yl, tetrahydro-1,3-thiazin-5-yl,
 tetrahydro-1,3-thiazin-6-yl, tetrahydro-1,4-thiazin-2-yl,
 tetrahydro-1,4-thiazin-3-yl, tetrahydro-1,4-oxazin-2-yl,
 tetrahydro-1,4-oxazin-3-yl, tetrahydro-1,2-oxazin-3-yl,
 tetrahydro-1,2-oxazin-4-yl, tetrahydro-1,2-oxazin-5-yl,
 tetrahydro-1,2-oxazin-6-yl, 2H-5,6-dihydro-1,2-oxazin-3-yl,
 20 2H-5,6-dihydro-1,2-
 oxazin-4-yl, 2H-5,6-dihydro-1,2-oxazin-5-yl,
 2H-5,6-dihydro-1,2-oxazin-6-yl, 2H-5,6-dihydro-
 1,2-thiazin-3-yl, 2H-5,6-dihydro-1,2-thiazin-4-yl,
 25 2H-5,6-dihydro-1,2-thiazin-5-yl, 2H-5,6-dihydro-1,2-
 thiazin-6-yl, 4H-5,6-dihydro-1,2-oxazin-3-yl,
 4H-5,6-dihydro-1,2-oxazin-4-yl, 4H-5,6-dihydro-
 1,2-oxazin-5-yl, 4H-5,6-dihydro-1,2-oxazin-6-yl,
 4H-5,6-dihydro-1,2-thiazin-3-yl, 4H-5,6-dihydro-1,2-
 30 thiazin-4-yl, 4H-5,6-dihydro-1,2-thiazin-5-yl,
 4H-5,6-dihydro-1,2-thiazin-6-yl, 2H-3,6-dihydro-1,2-
 oxazin-3-yl, 2H-3,6-dihydro-1,2-oxazin-4-yl,
 2H-3,6-dihydro-1,2-oxazin-5-yl, 2H-3,6-dihydro-1,2-
 oxazin-6-yl, 2H-3,6-dihydro-1,2-thiazin-3-yl,
 2H-3,6-dihydro-1,2-thiazin-4-yl, 2H-3,6-dihydro-1,2-
 35 thiazin-5-yl, 2H-3,6-dihydro-1,2-thiazin-6-yl,
 2H-3,4-dihydro-1,2-oxazin-3-yl, 2H-3,4-dihydro-1,2-
 oxazin-4-yl, 2H-3,4-dihydro-1,2-oxazin-5-yl,
 2H-3,4-dihydro-1,2-oxazin-6-yl, 2H-3,4-dihydro-1,2-
 thiazin-3-yl, 2H-3,4-dihydro-1,2-thiazin-4-yl,
 40 2H-3,4-dihydro-1,2-thiazin-5-yl, 2H-3,4-dihydro-
 1,2-thiazin-6-yl, 2,3,4,5-tetrahydropyridazin-3-yl,
 2,3,4,5-tetrahydropyridazin-4-yl,
 2,3,4,5-tetrahydropyridazin-5-yl,
 45 2,3,4,5-tetrahydropyridazin-6-yl,
 3,4,5,6-tetrahydropyridazin-3-yl,
 3,4,5,6-tetrahydropyridazin-4-yl,
 1,2,5,6-tetrahydropyridazin-3-yl,

1,2,5,6-tetrahydropyridazin-4-yl,
 1,2,5,6-tetrahydropyridazin-5-yl,
 1,2,5,6-tetrahydropyridazin-6-yl,
 1,2,3,6-tetrahydropyridazin-3-yl,
 5 1,2,3,6-tetrahydropyridazin-4-yl,
 4H-5,6-dihydro-1,3-oxazin-2-yl,
 4H-5,6-dihydro-1,3-oxazin-4-yl,
 4H-5,6-dihydro-1,3-oxazin-5-yl,
 4H-5,6-dihydro-1,3-oxazin-6-yl,
 10 4H-5,6-dihydro-1,3-thiazin-2-yl,
 4H-5,6-dihydro-1,3-thiazin-4-yl,
 4H-5,6-dihydro-1,3-thiazin-5-yl, 4H-5,6-dihydro-
 1,3-thiazin-6-yl, 3,4,5-6-tetrahydropyrimidin-2-yl,
 15 3,4,5,6-tetrahydropyrimidin-4-yl, 3,4,5,6-tetrahydro-
 pyrimidin-5-yl, 3,4,5,6-tetrahydropyrimidin-6-yl,
 1,2,3,4-tetrahydropyrazin-2-yl, 1,2,3,4-tetrahydro-
 pyrazin-5-yl, 1,2,3,4-tetrahydropyrimidin-2-yl,
 1,2,3,4-tetrahydropyrimidin-4-yl, 1,2,3,4-tetrahydro-
 pyrimidin-5-yl, 1,2,3,4-tetrahydropyrimidin-6-yl,
 20 2,3-dihydro-1,4-thiazin-2-yl, 2,3-dihydro-1,4-thiazin-3-yl,
 2,3-dihydro-1,4-thiazin-5-yl, 2,3-dihydro-1,4-thiazin-6-yl,
 2H-1,2-oxazin-3-yl, 2H-1,2-oxazin-4-yl, 2H-1,2-oxazin-5-yl,
 2H-1,2-oxazin-6-yl, 2H-1,2-thiazin-3-yl, 2H-1,2-thiazin-4-yl,
 2H-1,2-thiazin-5-yl, 2H-1,2-thiazin-6-yl, 4H-1,2-oxazin-3-yl,
 25 4H-1,2-oxazin-4-yl, 4H-1,2-oxazin-5-yl, 4H-1,2-oxazin-6-yl,
 4H-1,2-thiazin-3-yl, 4H-1,2-thiazin-4-yl,
 4H-1,2-thiazin-5-yl, 4H-1,2-thiazin-6-yl, 6H-1,2-oxazin-3-yl,
 6H-1,2-oxazin-4-yl, 6H-1,2-oxazin-5-yl, 6H-1,2-oxazin-6-yl,
 6H-1,2-thiazin-3-yl, 6H-1,2-thiazin-4-yl,
 30 6H-1,2-thiazin-5-yl, 6H-1,2-thiazin-6-yl, 2H-1,3-oxazin-2-yl,
 2H-1,3-oxazin-4-yl, 2H-1,3-oxazin-5-yl, 2H-1,3-oxazin-6-yl,
 2H-1,3-thiazin-2-yl, 2H-1,3-thiazin-4-yl, 2H-1,3-thiazin-5-
 yl, 2H-1,3-thiazin-6-yl, 4H-1,3-oxazin-2-yl, 4H-1,3-oxazin-
 4-yl, 4H-1,3-oxazin-5-yl, 4H-1,3-oxazin-6-yl, 4H-1,3-thiazin-
 35 2-yl, 4H-1,3-thiazin-4-yl, 4H-1,3-thiazin-5-yl,
 4H-1,3-thiazin-6-yl, 6H-1,3-oxazin-2-yl, 6H-1,3-oxazin-4-yl,
 6H-1,3-oxazin-5-yl, 6H-1,3-oxazin-6-yl, 6H-1,3-thiazin-2-yl,
 6H-1,3-oxazin-4-yl, 6H-1,3-oxazin-5-yl, 6H-1,3-thiazin-6-yl,
 2H-1,4-oxazin-2-yl, 2H-1,4-oxazin-3-yl, 2H-1,4-oxazin-5-yl,
 40 2H-1,4-oxazin-6-yl, 2H-1,4-thiazin-2-yl, 2H-1,4-thiazin-3-yl,
 2H-1,4-thiazin-5-yl, 2H-1,4-thiazin-6-yl, 4H-1,4-oxazin-2-yl,
 4H-1,4-oxazin-3-yl, 4H-1,4-thiazin-2-yl, 4H-1,4-thiazin-3-yl,
 1,4-dihydropyridazin-3-yl, 1,4-dihydropyridazin-4-yl,
 1,4-dihydropyridazin-5-yl, 1,4-dihydropyridazin-6-yl,
 45 1,4-dihydropyrazin-2-yl, 1,2-dihydropyrazin-2-yl,
 1,2-dihydropyrazin-3-yl, 1,2-dihydropyrazin-5-yl,
 1,2-dihydropyrazin-6-yl, 1,4-dihydropyrimidin-2-yl,

1,4-dihdropyrimidin-4-yl, 1,4-dihdropyrimidin-5-yl,
 1,4-dihdropyrimidin-6-yl, 3,4-dihdropyrimidin-2-yl,
 3,4-dihdropyrimidin-4-yl, 3,4-dihdropyrimidin-5-yl or
 3,4-dihdropyrimidin-6-yl, pyridazin-3-yl, pyridazin-4-yl,
 5 pyrimidin-2-yl, pyrimidin-4-yl, pyrimidin-5-yl or
 pyrazin-2-yl;

6-membered rings having 3 hetero atoms such as, for example,

10 1,3,5-triazin-2-yl, 1,2,4-triazin-3-yl, 1,2,4-triazin-5-yl or
 1,2,4-triazin-6-yl;

6-membered rings having 4 hetero atoms such as, for example,

15 1,2,4,5-tetrazin-3-yl;

where, if appropriate, the sulfur of the abovementioned heterocycles may be oxidized to S=O or S(=O)₂;

20 and where a bicyclic ring system may be formed with a fused-on phenyl ring or with a C₃-C₆-carbocycle or with another 5- to 6-membered heterocycle.

25 - N-linked heterocyclyl: a saturated, partially saturated or unsaturated 5- or 6-membered heterocyclic ring which is attached via nitrogen and which contains at least one nitrogen and optionally one to three identical or different hetero atoms selected from the following group: oxygen, 30 sulfur or nitrogen, i.e., for example,

5-membered rings having 1 hetero atom which are linked by a nitrogen, such as, for example,

35 tetrahydropyrrol-1-yl, 2,3-dihydro-1H-pyrrol-1-yl,
 2,5-dihydro-1H-pyrrol-1-yl or pyrrol-1-yl;

40 5-membered rings having 2 hetero atoms which are linked by a nitrogen such as, for example,

45 tetrahydropyrazol-1-yl, tetrahydroisoxazol-2-yl,
 tetrahydroisothiazol-2-yl, tetrahydroimidazol-1-yl,
 tetrahydrooxazol-3-yl, tetrahydrothiazol-3-yl,
 4,5-dihydro-1H-pyrazol-1-yl, 2,5-dihydro-1H-pyrazol-1-yl,
 2,3-dihydro-1H-pyrazol-1-yl, 2,5-dihydroisoxazol-2-yl,
 2,3-dihydroisoxazol-2-yl, 2,5-dihydroisothiazol-2-yl,

2,3-dihydroisoxazol-2-yl, 4,5-dihydro-1H-imidazol-1-yl,
 2,5-dihydro-1H-imidazol-1-yl, 2,3-dihydro-1H-imidazol-1-yl,
 2,3-dihydrooxazol-3-yl, 2,3-dihydrothiazol-3-yl, pyrazol-1-yl
 or imidazol-1-yl;

5

5-membered rings having 3 hetero atoms which are linked by a nitrogen such as, for example,

10 1,2,4- Δ^4 -oxadiazolin-2-yl, 1,2,4- Δ^2 -oxadiazolin-4-yl,
 1,2,4- Δ^3 -oxadiazolin-2-yl, 1,3,4- Δ^2 -oxadiazolin-4-yl,
 1,2,4- Δ^5 -thiadiazolin-2-yl, 1,2,4- Δ^3 -thiadiazolin-2-yl,
 1,2,4- Δ^2 -thiadiazolin-4-yl, 1,3,4- Δ^2 -thiadiazolin-4-yl,
 1,2,3- Δ^2 -triazolin-1-yl, 1,2,4- Δ^2 -triazolin-1-yl,
 15 1,2,4- Δ^2 -triazolin-4-yl, 1,2,4- Δ^3 -triazolin-1-yl, 1,2,4- Δ^1 -triazolin-4-yl, 1,2,3-triazol-1-yl or 1,2,4-triazol-1-yl;

20 5-membered rings having 4 hetero atoms which are linked by a nitrogen such as, for example,

20 tetrazol-1-yl;

25 and 6-membered rings having 1 hetero atom which are linked by a nitrogen, such as, for example

25 piperidin-1-yl, 1,2,3,4-tetrahydropyridin-1-yl,
 1,2,5,6-tetrahydropyridin-1-yl, 1,4-dihydropyridin-1-yl or
 1,2-dihydropyridin-1-yl;

30 6-membered rings having 2 hetero atoms which are linked by a nitrogen such as, for example,

35 hexahydropyrimidin-1-yl, hexahydropyrazin-1-yl,
 hexahydropyridazin-1-yl, tetrahydro-1,3-oxazin-3-yl,
 tetrahydro-1,3-thiazin-3-yl, tetrahydro-1,4-thiazin-4-yl,
 tetrahydro-1,4-oxazin-4-yl, tetrahydro-1,2-oxazin-2-yl,
 2H-5,6-dihydro-1,2-oxazin-2-yl,
 2H-5,6-dihydro-1,2-thiazin-2-yl, 2H-3,6-dihydro-1,2-
 40 oxazin-2-yl, 2H-3,6-dihydro-1,2-thiazin-oxazin-2-yl,
 2H-3,4-dihydro-1,2-thiazin-2-yl, 2,3,4,5-tetrahydro-
 pyridazin-2-yl, 1,2,5,6-tetrahydropyridazin-1-yl,
 1,2,5,6-tetrahydropyridazin-2-yl, 1,2,3,6-tetrahydro-
 pyridazin-1-yl, 3,4,5,6-tetrahydropyrimidin-3-yl,
 45 1,2,3,4-tetrahydropyrazin-1-yl, 1,2,3,4-tetrahydro-
 pyrimidin-1-yl, 1,2,3,4-tetrahydropyrimidin-3-yl,
 2,3-dihydro-1,4-thiazin-4-yl, 2H-1,2-oxazin-2-yl,

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2H-1,2-thiazin-2-yl, 4H-1,4-oxazin-4-yl, 4H-1,4-thiazin-4-yl, 1,4-dihydropyridazin-1-yl, 1,4-dihydropyrazin-1-yl, 1,2-dihydropyrazin-1-yl, 1,4-dihydropyrimidin-1-yl or 3,4-dihydropyrimidin-3-yl, and also cyclic imides which are

5 linked via nitrogen, such as:

phthalimide, tetrahydraphthalimide, succinimide, maleimide or glutarimide, and also 4-oxo-1,4-dihydropyridin-1-yl.

10 All phenyl rings or heterocyclyl radicals, and also all phenyl components in phenyl-C₁-C₆-alkyl, phenylcarbonyl-C₁-C₆-alkyl, phenoxy, phenylthio, phenylcarbonyl, phenylalkenylcarbonyl, phenoxy carbonyl, phenoxyalkylcarbonyl, phenylaminocarbonyl and N-(C₁-C₆-alkyl)-N-phenylaminocarbonyl or heterocyclyl components in heterocyclyl-C₁-C₆-alkyl, heterocyclylcarbonyl-C₁-C₆-alkyl,

15 15 heterocycloloxy, heterocyclothio, heterocyclylcarbonyl, heterocyclalkenylcarbonyl, heterocycloloxyalkylcarbonyl, heterocycloloxy carbonyl, heterocyclaminocarbonyl and N-(C₁-C₆-alkyl)-N-heterocyclaminocarbonyl are, unless stated otherwise, preferably unsubstituted, or they carry one to three

20 20 halogen atoms and/or one nitro group, one cyano radical and/or one or two methyl, trifluoromethyl, methoxy or trifluoromethoxy substituents.

25 The compounds of the formula I according to the invention where R⁴ = IIa are referred to as compounds of the formula Ia, and compounds of the formula I where R⁴ = IIb are referred to as Ib.

The compounds of the formula I should be particularly emphasized, where

30 30

R⁷ is C₁-C₆-alkyl, C₃-C₆-alkenyl, C₃-C₆-haloalkenyl, C₃-C₆-alkynyl, C₃-C₆-haloalkynyl, C₃-C₆-cycloalkyl, C₁-C₂₀-alkylcarbonyl, C₂-C₆-alkenylcarbonyl, C₂-C₆-alkynylcarbonyl, C₃-C₆-cycloalkylcarbonyl, C₁-C₆-alkoxycarbonyl, C₃-C₆-alkenyloxycarbonyl, C₃-C₆-alkynylloxycarbonyl, C₁-C₆-alkylthiocarbonyl, C₁-C₆-alkylaminocarbonyl, C₃-C₆-alkenylaminocarbonyl, C₃-C₆-alkynylaminocarbonyl, N,N-di-(C₁-C₆-alkyl)-aminocarbonyl, N-(C₃-C₆-alkenyl)-N-(C₁-C₆-alkyl)-aminocarbonyl, N-(C₃-C₆-alkynyl)-N-(C₁-C₆-alkyl)-aminocarbonyl, N-(C₁-C₆-alkoxy)-N-(C₁-C₆-alkyl)-aminocarbonyl, N-(C₃-C₆-alkenyl)-N-(C₁-C₆-alkoxy)-aminocarbonyl, N-(C₃-C₆-alkynyl)-N-(C₁-C₆-alkoxy)-aminocarbonyl, di-(C₁-C₆-alkyl)aminothiocarbonyl, C₁-C₆-alkylcarbonyl-C₁-C₆-alkyl, C₁-C₆-alkoxyimino-C₁-C₆-alkyl, N-(C₁-C₆-alkylamino)imino-C₁-C₆-alkyl or N,N-di-(C₁-C₆-alkylamino)imino-C₁-C₆-alkyl, where the

alkyl, cycloalkyl and alkoxy radicals mentioned may be partially or fully halogenated and/or may carry one to three of the following groups:

5 cyano, C₁–C₄–alkoxy, C₁–C₄–alkylthio, di-(C₁–C₄–alkyl)–
amino, C₁–C₄–alkylcarbonyl, C₁–C₄–alkoxycarbonyl,

C₁–C₄–alkoxy–C₁–C₄–alkoxycarbonyl, di–(C₁–C₄–alkyl)–amino–C₁–C₄–alkoxycarbonyl, hydroxycarbonyl,

C₁–C₄–alkylaminocarbonyl,

di-(C₁-C₄-alkyl)aminocarbonyl, aminocarbonyl,

10 C_1-C_4 -alkylcarbonyloxy or C_3-C_6 -cycloalkyl;

phenyl, heterocyclyl, phenyl-C₁-C₆-alkyl, heterocyclyl-C₁-C₆-alkyl, phenylcarbonyl-C₁-C₆-alkyl, heterocyclyl-carbonyl-C₁-C₆-alkyl, phenylcarbonyl, heterocyclyl-

15 carbonyl, phenoxy carbonyl, heterocyclic oxycarbonyl, phenoxythiocarbonyl, heterocyclic oxythiocarbonyl, phenoxy S-C₆ alkyl carbonyl, heterocyclic oxy S-C₆

phenoxy- C_1-C_6 -alkylcarbonyl, heterocyclioxy- C_1-C_6 -alkylcarbonyl, phenylaminocarbonyl, $N-(C_1-C_6\text{-alkyl})N-(\text{phenyl})\text{aminocarbonyl}$, heterocyclylaminocarbonyl

20 N-(C₁-C₆-alkyl)-N-(heterocyclyl)aminocarbonyl,
phenyl-C₂-C₆-alkenylcarbonyl or heterocyclyl-
C₂-C₆-alkenyl, located above the phenyl and the

C_2-C_6 -alkenylcarbonyl, where the phenyl and the substituents are linked to the 22 last-mentioned

heterocyclic radical of the 20 last-mentioned substituents may be partially or fully halogenated, as indicated in the following

25 and/or may carry one to three of the following radicals:

nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

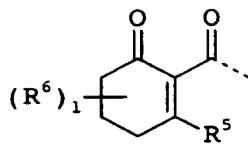
30 With a view to the use of the compounds of the formula I according to the invention as herbicides, the variables preferably have the following meanings, in each case on their own or in combination:

35 R^1 is nitro, halogen, C_1-C_6 -alkyl, C_1-C_6 -haloalkyl, C_1-C_6 -alkoxy, C_1-C_6 -haloalkoxy, C_1-C_6 -alkylthio, C_1-C_6 -haloalkylthio, C_1-C_6 -alkylsulfonyl or C_1-C_6 -haloalkylsulfonyl;

40 R^2, R^3 are hydrogen, C_1-C_6 -alkyl or halogen;

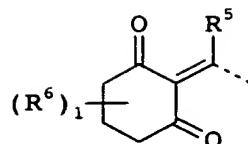
R^4 is a compound of IIa or IIb

45



5

IIIa



IIIb

where

10

R^5 is halogen, OR^7 , SR^7 , SO_2R^8 , OSO_2R^8 , $OPOR^8R^9$, OPR^8R^9 , $OPSR^8R^9$, $NR^{10}R^{11}$, $ONR^{11}R^{12}$, N-linked heterocyclyl or O-(N-linked heterocyclyl), where the heterocyclyl radical of the two last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

nitro, cyano, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy or C_1 - C_4 -haloalkoxy;

15

20

R^6 is halogen, cyano, C_1 - C_6 -alkyl, C_1 - C_6 -haloalkyl, di-(C_1 - C_6 -alkoxy)methyl, di-(C_1 - C_6 -alkylthio)methyl, (C_1 - C_6 -alkoxy)(C_1 - C_6 -alkylthio)methyl, hydroxyl, C_1 - C_6 -alkoxy, C_1 - C_6 -haloalkoxy, C_1 - C_6 -alkoxycarbonyloxy, C_1 - C_6 -alkylthio, C_1 - C_6 -haloalkylthio, C_1 - C_6 -alkylsulfonyl, C_1 - C_6 -haloalkylsulfonyl, C_1 - C_6 -alkylcarbonyl, C_1 - C_6 -haloalkylcarbonyl, C_1 - C_6 -alkoxycarbonyl or C_1 - C_6 -haloalkoxycarbonyl;

25

30 or

35

two radicals R^6 , which are linked to the same carbon, together form an $-O-(CH_2)_m-O-$, $-O-(CH_2)_m-S-$, $-S-(CH_2)_m-S-$, $-O-(CH_2)_n-$ or $-S-(CH_2)_n-$ chain which may be substituted by one to three radicals from the following group:

halogen, cyano, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl or C_1 - C_4 -alkoxycarbonyl;

40

or

45

two radicals R^6 , which are linked to the same carbon, together form a $-(CH_2)_p$ chain which may be interrupted by oxygen or sulfur and/or may be substituted by one to four radicals from the following group:

halogen, cyano, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl or C_1 - C_4 -alkoxycarbonyl;

or

5

two radicals R^6 , which are linked to the same carbon, together with this carbon form a carbonyl group;

or

10

two radicals R^6 , which are linked to different carbons, together form a $-(CH_2)_n$ chain which may be substituted by one to three radicals from the following group:

15

halogen, C_1 - C_6 -alkyl, C_1 - C_6 -alkoxy, hydroxyl or C_1 - C_6 -alkoxycarbonyl;

R^7

is C_1 - C_6 -alkyl, C_3 - C_6 -alkenyl, C_3 - C_6 -haloalkenyl, C_3 - C_6 -alkynyl, C_1 - C_{20} -alkylcarbonyl, C_2 - C_6 -alkenylcarbonyl, C_3 - C_6 -cycloalkylcarbonyl, C_1 - C_6 -alkoxycarbonyl, C_3 - C_6 -alkenyloxy carbonyl, C_3 - C_6 -alkynylcarbonyl, $(C_1$ - C_{20} -alkylthio)carbonyl (particularly preferably $(C_1$ - C_6 -alkylthio)carbonyl), C_1 - C_6 -alkylaminocarbonyl, C_3 - C_6 -alkenylaminocarbonyl, C_3 - C_6 -alkynylaminocarbonyl,

20

N,N -di- $(C_1$ - C_6 -alkyl)aminocarbonyl,

25

$N-(C_3$ - C_6 -alkenyl)- $N-(C_1$ - C_6 -alkyl)aminocarbonyl,

$N-(C_3$ - C_6 -alkynyl)- $N-(C_1$ - C_6 -alkyl)aminocarbonyl,

$N-(C_1$ - C_6 -alkoxy)- $N-(C_1$ - C_6 -alkyl)aminocarbonyl,

$N-(C_3$ - C_6 -alkenyl)- $N-(C_1$ - C_6 -alkoxy)aminocarbonyl,

30

$N-(C_3$ - C_6 -alkynyl)- $N-(C_1$ - C_6 -alkoxy)aminocarbonyl,

$di-(C_1$ - C_6 -alkyl)aminothiocarbonyl,

C_1 - C_6 -alkylcarbonyl- C_1 - C_6 -alkyl,

C_1 - C_6 -alkoxyimino- C_1 - C_6 -alkyl,

$N-(C_1$ - C_6 -alkylamino)imino- C_1 - C_6 -alkyl or

35

N,N -di- $(C_1$ - C_6 -alkylamino)imino- C_1 - C_6 -alkyl, where the

abovementioned alkyl, cycloalkyl and alkoxy radicals

may be partially or fully halogenated and/or may carry one to three of the following groups:

40

cyano, C_1 - C_4 -alkoxy, C_1 - C_4 -alkylthio,

C_1 - C_4 -alkylcarbonyl, C_1 - C_4 -alkoxycarbonyl,

hydroxycarbonyl, $di-(C_1$ - C_4 -alkyl)aminocarbonyl,

C_1 - C_4 -alkylcarbonyloxy or C_3 - C_6 -cycloalkyl;

45

phenyl, heterocyclyl, phenyl- C_1 - C_6 -alkyl,

heterocyclyl- C_1 - C_6 -alkyl, phenylcarbonyl- C_1 - C_6 -alkyl,

heterocyclylcarbonyl- C_1 - C_6 -alkyl, phenylcarbonyl,

39

heterocyclcarbonyl, phenoxy carbonyl,
 heterocycloxycarbonyl, phenoxythiocarbonyl,
 heterocycloxythiocarbonyl,
 phenoxy-C₁-C₆-alkylcarbonyl,
 5 heterocycloxy-C₁-C₆-alkylcarbonyl,
 phenyl-C₂-C₆-alkenylcarbonyl or
 heterocycl-C₂-C₆-alkenylcarbonyl, where the phenyl
 and the heterocycl radical of the 16 last mentioned
 10 substituents may be partially or fully halogenated
 and/or may carry one to three of the following
 radicals:
 nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy
 or C₁-C₄-haloalkoxy;

15 R⁸, R⁹ are C₁-C₆-alkyl, C₃-C₆-alkenyl, C₃-C₆-haloalkenyl,
 C₃-C₆-cycloalkyl, hydroxy, C₁-C₆-alkoxy,
 di-C₁-C₆-alkylamino, or di-(C₁-C₆-haloalkyl)amino,
 20 where the abovementioned alkyl, cycloalkyl and alkoxy
 radicals may be partially or fully halogenated and/or
 may carry one to three of the following groups:
 cyano, C₁-C₄-alkoxy, C₁-C₄-alkylthio,
 C₁-C₄-alkylcarbonyl, C₁-C₄-alkoxycarbonyl,
 hydroxycarbonyl, di-(C₁-C₄-alkyl)aminocarbonyl,
 25 C₁-C₄-alkylcarbonyloxy or C₃-C₆-cycloalkyl;
 phenyl, heterocycl, phenyl-C₁-C₆-alkyl,
 heterocycl-C₁-C₆-alkyl, phenoxy, heterocycloxy,
 30 where the phenyl- and the heterocycl radical of the
 last-mentioned substituents may be partially or fully
 halogenated and/or may carry one to three of the
 following radicals:
 nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy
 or C₁-C₄-haloalkoxy;

35 R¹⁰ is C₁-C₆-alkyl, C₃-C₆-alkenyl, C₃-C₆-haloalkenyl,
 C₃-C₆-cycloalkyl, C₁-C₆-alkoxy, C₃-C₆-alkenyloxy or
 di-(C₁-C₆-alkyl)amino, where the abovementioned alkyl,
 40 cycloalkyl and alkoxy radicals may be partially or
 fully halogenated and/or may carry one to three
 radicals from the following group:

45

40

cyano, C₁-C₄-alkoxy, C₁-C₄-alkylthio,
 C₁-C₄-alkylcarbonyl, C₁-C₄-alkoxycarbonyl,
 hydroxycarbonyl, di-(C₁-C₄-alkyl)aminocarbonyl,
 C₁-C₄-alkylcarbonyloxy or C₃-C₆-cycloalkyl;

5

phenyl, heterocyclyl, phenyl-C₁-C₆-alkyl or
 heterocyclyl-C₁-C₆-alkyl, where the phenyl or
 heterocyclyl radical of the four last-mentioned
 10 substituents may be partially or fully halogenated
 and/or may carry one to three of the following
 radicals:

nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy
 or C₁-C₄-haloalkoxy;

15

R¹¹, R¹² are C₁-C₆-alkyl or C₃-C₆-alkenyl;

1 0 to 6;

20 m 2 to 4;

n 1 to 5;

25 p 2 to 5.

Particular preference is given to compounds of the formula I
 where the variables have the following meanings, either on their
 own or in combination:

30

R¹ is halogen, C₁-C₆-alkyl, C₁-C₆-haloalkyl, C₁-C₆-alkoxy,
 C₁-C₆-alkylthio or C₁-C₆-alkylsulfonyl;
 in particular halogen, such as fluorine or chlorine,
 35 C₁-C₆-alkyl, such as methyl or ethyl, C₁-C₆-haloalkyl,
 such as difluoromethyl or trifluoromethyl;
 particularly preferably fluorine, chlorine, methyl,
 difluoromethyl or trifluoromethyl;

40 R²

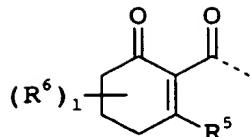
is hydrogen or C₁-C₆-alkyl, such as methyl or ethyl;
 in particular hydrogen or methyl;

R³ is hydrogen or C₁-C₆-alkyl; in particular hydrogen;

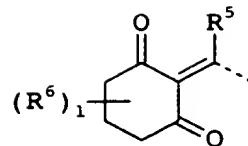
45 R⁴

is a compound IIa or IIb

5



IIa



IIb

where

10

R^5 is halogen, OR^7 , SR^7 , SO_2R^8 , OSO_2R^8 , $NR^{10}R^{11}$, $ONR^{11}R^{12}$, N-linked heterocyclyl or O-(N-linked heterocyclyl), where the heterocyclyl radical of the two last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

15

nitro, cyano, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy or C_1 - C_4 -haloalkoxy;

20

R^6 is halogen, cyano, C_1 - C_6 -alkyl, C_1 - C_6 -haloalkyl, di-(C_1 - C_6 -alkoxy)methyl, di-(C_1 - C_6 -alkylthio)methyl, (C_1 - C_6 -alkoxy)(C_1 - C_6 -alkylthio)methyl, hydroxyl, C_1 - C_6 -alkoxy, C_1 - C_6 -haloalkoxy, C_1 - C_6 -alkoxycarbonyloxy, C_1 - C_6 -alkylthio or C_1 - C_6 -haloalkylthio;

25

or

30

two radicals R^6 , which are linked to the same carbon, together with this carbon form a carbonyl group;

40

45

R^7 is C_1 - C_6 -alkyl, C_3 - C_6 -alkenyl, C_3 - C_6 -haloalkenyl, C_3 - C_6 -alkynyl, C_1 - C_{20} -alkylcarbonyl, C_3 - C_6 -cycloalkylcarbonyl, C_1 - C_6 -alkoxycarbonyl, C_3 - C_6 -alkenyloxy carbonyl, C_1 - C_6 -alkylaminocarbonyl, C_3 - C_6 -alkenylaminocarbonyl, N,N -di(C_1 - C_6 -alkyl)aminocarbonyl, N -(C_3 - C_6 -alkenyl)- N -(C_1 - C_6 -alkyl)aminocarbonyl, N -(C_1 - C_6 -alkoxy)- N -(C_1 - C_6 -alkyl)aminocarbonyl, N -(C_3 - C_6 -alkenyl)- N -(C_1 - C_6 -alkoxy)aminocarbonyl, di-(C_1 - C_6 -alkyl)aminothiocarbonyl or C_1 - C_6 -alkylcarbonyl- C_1 - C_6 -alkyl, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three of the following groups:

cyano, C_1-C_4 -alkoxy, C_1-C_4 -alkylthio,
 C_1-C_4 -alkylcarbonyl, C_1-C_4 -alkoxycarbonyl,
hydroxycarbonyl, di-(C_1-C_4 -alkyl)aminocarbonyl,
 C_1-C_4 -alkylcarbonyloxy or C_3-C_6 -cycloalkyl;

5

phenyl, heterocyclyl, phenyl- C_1-C_6 -alkyl,
heterocyclyl- C_1-C_6 -alkyl, phenylcarbonyl- C_1-C_6 -alkyl,
heterocyclylcarbonyl- C_1-C_6 -alkyl, phenylcarbonyl,
heterocyclylcarbonyl, phenoxy carbonyl,
heterocyclylcarbonyl, phenoxythiocarbonyl,
heterocyclylcarbonyl, phenoxythiocarbonyl,
phenoxy- C_1-C_6 -alkylcarbonyl or
heterocyclyl- C_1-C_6 -alkylcarbonyl, where the phenyl
and the heterocyclyl radical of the 14 last-mentioned
15 substituents may be partially or fully halogenated
and/or may carry one to three of the following
radicals:
nitro, cyano, C_1-C_4 -alkyl, C_1-C_4 -haloalkyl, C_1-C_4 -alkoxy
or C_1-C_4 -haloalkoxy;

10

15

20

R^8 is C_1-C_6 -alkyl, C_3-C_6 -alkenyl, C_3-C_6 -haloalkenyl,
 C_3-C_6 -cycloalkyl, hydroxyl, C_1-C_6 -alkoxy,
di- C_1-C_6 -alkylamino or di-(C_1-C_6 -haloalkyl)amino, where
the abovementioned alkyl, cycloalkyl and alkoxy
25 radicals may be partially or fully halogenated and/or
may carry one to three of the following groups:

25

30

35

40

45

cyano, C_1-C_4 -alkoxy, C_1-C_4 -alkylthio,
 C_1-C_4 -alkylcarbonyl, C_1-C_4 -alkoxycarbonyl,
hydroxycarbonyl, di-(C_1-C_4 -alkyl)aminocarbonyl,
 C_1-C_4 -alkylcarbonyloxy or C_3-C_6 -cycloalkyl;
phenyl, heterocyclyl, phenyl- C_1-C_6 -alkyl,
heterocyclyl- C_1-C_6 -alkyl, phenoxy, heterocyclylloxy,
where the phenyl and the heterocyclyl radical of the
last-mentioned substituents may be partially or fully
halogenated and/or may carry one to three of the
following radicals:

nitro, cyano, C_1-C_4 -alkyl, C_1-C_4 -haloalkyl, C_1-C_4 -alkoxy
or C_1-C_4 -haloalkoxy;

R^{10} is C_1-C_6 -alkyl, C_3-C_6 -alkenyl, C_3-C_6 -haloalkenyl,
 C_3-C_6 -cycloalkyl, C_1-C_6 -alkoxy, C_3-C_6 -alkenylloxy or
di-(C_1-C_6 -alkyl)amino, where the abovementioned alkyl,
cycloalkyl and alkoxy radicals may be partially or

fully halogenated and/or may carry one to three radicals from the following group:

5 cyano, C₁-C₄-alkoxy, C₁-C₄-alkylthio,
C₁-C₄-alkylcarbonyl, C₁-C₄-alkoxycarbonyl,
hydroxycarbonyl, di-(C₁-C₄-alkyl)aminocarbonyl,
C₁-C₄-alkylcarbonyloxy or C₃-C₆-cycloalkyl;

10 phenyl, heterocyclyl, phenyl-C₁-C₆-alkyl or heterocyclyl-C₁-C₆-alkyl, where the phenyl or heterocyclyl radical of the four last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

15 nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

R¹¹, R¹² are C₁-C₆-alkyl or C₃-C₆-alkenyl;

20 1 is 0 to 6.

Particular preference is also given to the compounds of the formula I where the variables have the following meaning, on their own or in combination:

25 R¹ is halogen, C₁-C₆-alkyl, C₁-C₆-haloalkyl, C₁-C₆-alkoxy, C₁-C₆-alkylthio, heterocyclloxy or phenylthio, where the two last-mentioned radicals may be partially or fully halogenated and/or may carry one to three of the substituents mentioned below:

30 nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;
particularly preferably halogen, C₁-C₆-alkyl or C₁-C₆-alkylthio;

35 R² is hydrogen, C₁-C₆-alkyl or C₁-C₆-haloalkyl;
particularly preferably hydrogen;

R³ is hydrogen;

40 R⁵ is halogen, OR⁷, SR⁷, SOR⁸, SO₂R⁸, OSO₂R⁸, OPR⁸R⁹, OPOR⁸R⁹, OPSR⁸R⁹, NR¹⁰R¹¹ or N-bonded heterocyclyl which may be partially or fully halogenated and/or may carry one to three of the following radicals:

45 nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;
particularly preferably halogen, OR⁷, NR¹⁰R¹¹ or

N-bonded heterocyclyl which may be partially or fully halogenated and/or may carry one to three of the following radicals:

5 nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy
or C₁-C₄-haloalkoxy;
particularly preferably fluorine, OR⁷, NR¹⁰R¹¹ or
N-bonded heterocyclyl selected from the group
consisting of 4-morpholinyl or 4-oxo-1,4-dihydro-
pyrid-1-yl;

10 R⁶ is C₁-C₆-alkyl
 or two radicals R⁶ which are attached to the same
 carbon form, together with this carbon, a carbonyl
 group;

40 R⁸, R⁹ are C₁-C₆-alkyl, C₁-C₆-alkoxy, di-(C₁-C₆-alkyl)amino or phenyl, where the last-mentioned radical may be partially or fully halogenated and/or may carry one to three of the following radicals: nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

45 B^{10} is $\text{C}_1\text{-C}_6\text{-alkyl}$ or $\text{C}_1\text{-C}_6\text{-alkoxy}$:

R¹¹ is C₁-C₆-alkyl;
 1 is from 0 to 6;
 particularly preferably from 4 to 6;
 5 in particular 6.

Particular preference is also given to compounds of the formula I where

10 R⁶ is nitro, halogen, cyano, C₁-C₆-alkyl, C₁-C₆-haloalkyl, di-(C₁-C₆-alkoxy)methyl, di-(C₁-C₆-alkylthio)methyl, (C₁-C₆-alkoxy)(C₁-C₆-alkylthio)methyl, hydroxyl, C₁-C₆-alkoxy, C₁-C₆-haloalkoxy, C₁-C₆-alkoxycarbonyloxy, C₁-C₆-alkylthio, C₁-C₆-haloalkylthio,
 15 C₁-C₆-alkylsulfinyl, C₁-C₆-haloalkylsulfinyl, C₁-C₆-alkylsulfonyl, C₁-C₆-haloalkylsulfonyl, C₁-C₆-alkylcarbonyl, C₁-C₆-haloalkylcarbonyl, C₁-C₆-alkoxycarbonyl or C₁-C₆-haloalkoxycarbonyl;

20 or

two radicals R⁶, which are linked to the same carbon, together form an -O-(CH₂)_m-O-, -O-(CH₂)_m-O-, -O-(CH₂)_m-S-,
 25 -S-(CH₂)_m-S-, -O-(CH₂)_n- or -S-(CH₂)_n chain which may be substituted by one to three radicals from the following group:
 halogen, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl or
 30 C₁-C₄-alkoxycarbonyl;

or

two radicals R⁶, which are linked to the same carbon, form a -(CH₂)_p chain which may be interrupted by oxygen or sulfur and/or which may be substituted by one to four radicals from the following group:
 35 halogen, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl or C₁-C₄-alkoxycarbonyl;

40

or

two radicals R⁶, which are linked to the same carbon, together with this carbon form a carbonyl group.
 45

46

Particular preference is given to compounds of the formula I where

5 R^6 is nitro, halogen, cyano, C_1 - C_6 -alkyl, C_1 - C_6 -haloalkyl, di-(C_1 - C_6 -alkoxy)methyl, di-(C_1 - C_6 -alkylthio)methyl, (C_1 - C_6 -alkoxy)(C_1 - C_6 -alkylthio)methyl, hydroxyl, C_1 - C_6 -alkoxy, C_1 - C_6 -haloalkoxy, C_1 - C_6 -alkoxycarbonyloxy, C_1 - C_6 -alkylthio, C_1 - C_6 -haloalkylthio, C_1 - C_6 -alkylsulfinyl, C_1 - C_6 -haloalkylsulfinyl, C_1 - C_6 -alkylsulfonyl, C_1 - C_6 -haloalkylsulfonyl, C_1 - C_6 -alkylcarbonyl, C_1 - C_6 -haloalkylcarbonyl, C_1 - C_6 -alkoxycarbonyl or C_1 - C_6 -haloalkoxycarbonyl;

10

15 or

two radicals R^6 , which are linked to the same carbon, together with this carbon form a carbonyl group.

20 Particular preference is also given to the compounds of the formula I where

25 R^5 is halogen or (C_1 - C_{20} -alkylthio)carbonyloxy; particularly preferably fluorine or (C_1 - C_6 -alkylthio)carbonyloxy;

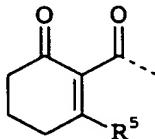
Particular preference is also given to the compounds of the formula I where

30 R^5 is $NR^{10}R^{11}$ or N-linked heterocyclyl which may be partially or fully halogenated and/or may carry one to three of the following radicals: nitro, cyano, C_1 - C_4 -alkyl, C_1 - C_4 -haloalkyl, C_1 - C_4 -alkoxy or C_1 - C_4 -haloalkoxy;

35

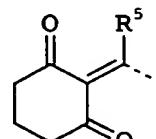
Particular preference is also given to the compounds of the formula I where R^4 has the following meanings:

40



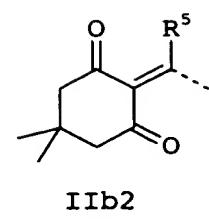
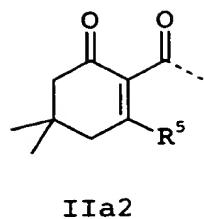
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IIa1

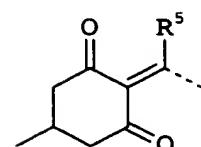
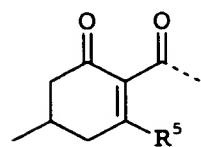


IIb1

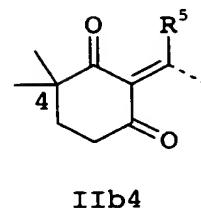
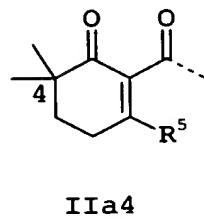
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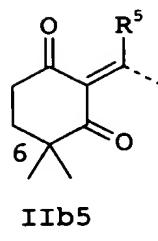
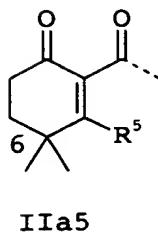
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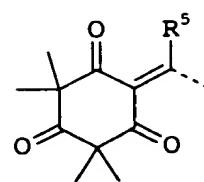
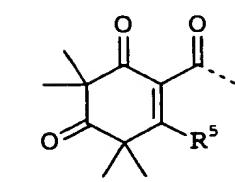


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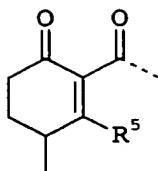


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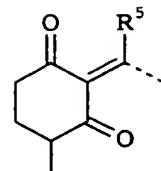
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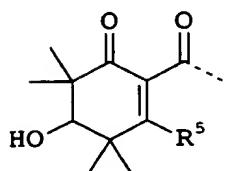


IIa7



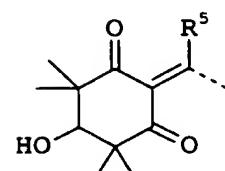
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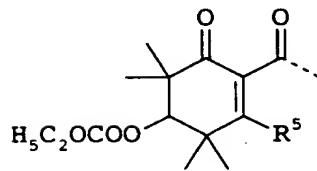
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IIa8

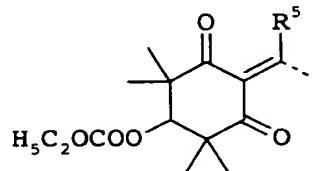


IIb8

20

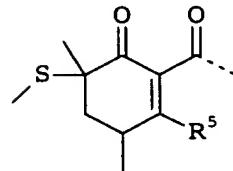


IIa9



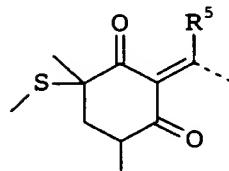
IIb9

25



IIa10

30



IIb10

Very particular preference is given to the compounds of the formula I where

35

R^5 is $NR^{10}R^{11}$ or tetrahydropyrrol-1-yl, 2,3-dihydro-1H-pyrrol-1-yl, 2,5-dihydro-1H-pyrrol-1-yl, pyrrol-1-yl, tetrahydropyrazol-1-yl, tetrahydroisoxazol-2-yl, tetrahydrothiazol-2-yl, tetrahydroimidazol-1-yl, tetrahydroooxazol-3-yl, tetrahydrothiazol-3-yl, pyrazol-1-yl, imidazol-1-yl, 1,2,4-triazol-1-yl, tetrazol-1-yl, piperidin-1-yl, 4-oxo-1,4-dihydro-1-pyridyl, hexahydropyrimidin-1-yl, hexahydropyrazin-1-yl, tetrahydro-1,4-oxazin-4-yl, tetrahydro-1,2-oxazin-2-yl, succinimide, maleimide or

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glutarimide, where the abovementioned heterocycles may be partially or fully halogenated and/or may carry one to three of the following radicals:

5 nitro, cyano, C₁-C₄-alkyl, such as methyl or ethyl, C₁-C₄-haloalkyl such as chloromethyl, difluoromethyl or trifluoromethyl, C₁-C₄-alkoxy, such as methoxy or ethoxy or C₁-C₄-haloalkoxy such as difluoromethoxy or trifluoromethoxy;

10 R¹⁰ C₁-C₆-alkoxy

Extraordinary preference is given to compounds of the formula Ia1 and Ib1 (= I where l = 0), in particular to the compounds Ia1.1 to 15 Ia1.456 and the compounds Ib1.1 to Ib1.456, where the radical definitions R¹ to R⁵ and l have a preferred meaning for the compounds according to the invention not only in combination with each other, but in each case also on their own.

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Table 1:

5				
10	Ia1	Ib1		
15	Ia1.1 or Ib1.1	CH ₃	H	H
20	Ia1.2 or Ib1.2	CH ₃	H	H
25	Ia1.3 or Ib1.3	CH ₃	H	H
30	Ia1.4 or Ib1.4	CH ₃	H	H
35	Ia1.5 or Ib1.5	CH ₃	H	H
40	Ia1.6 or Ib1.6	CH ₃	H	H
45	Ia1.7 or Ib1.7	CH ₃	H	H
	Ia1.8 or Ib1.8	CH ₃	H	H
	Ia1.9 or Ib1.9	CH ₃	H	H
	Ia1.10 or Ib1.10	CH ₃	H	H
	Ia1.11 or Ib1.11	CH ₃	H	H
	Ia1.12 or Ib1.12	CH ₃	H	H
	Ia1.13 or Ib1.13	CH ₃	H	H
	Ia1.14 or Ib1.14	CH ₃	H	H
	Ia1.15 or Ib1.15	CH ₃	H	H
	Ia1.16 or Ib1.16	CH ₃	H	H
	Ia1.17 or Ib1.17	CH ₃	H	H
	Ia1.18 or Ib1.18	CH ₃	H	H
	Ia1.19 or Ib1.19	CH ₃	H	H
	Ia1.20 or Ib1.20	CH ₃	H	H
	Ia1.21 or Ib1.21	CH ₃	H	H
	Ia1.22 or Ib1.22	CH ₃	H	H
	Ia1.23 or Ib1.23	CH ₃	H	H
	Ia1.24 or Ib1.24	CH ₃	H	H
	Ia1.25 or Ib1.25	CH ₃	H	H
	Ia1.26 or Ib1.26	CH ₃	H	H
	Ia1.27 or Ib1.27	CH ₃	H	H
	Ia1.28 or Ib1.28	CH ₃	H	H
	Ia1.29 or Ib1.29	CH ₃	H	H

No.	R ¹	R ²	R ³	R ⁵
Ial.30 or Ib1.30	CH ₃	H	H	OPO(CH ₃) ₂
Ial.31 or Ib1.31	CH ₃	H	H	OPO(CH ₂ CH ₃) ₂
Ial.32 or Ib1.32	CH ₃	H	H	OPO(C ₆ H ₅) ₂
Ial.33 or Ib1.33	CH ₃	H	H	OPS(OCH ₃) ₂
Ial.34 or Ib1.34	CH ₃	H	H	OPS(OCH ₂ CH ₃) ₂
Ial.35 or Ib1.35	CH ₃	H	H	OP(OCH ₃) ₂
Ial.36 or Ib1.36	CH ₃	H	H	OP(OCH ₂ CH ₃) ₂
Ial.37 or Ib1.37	CH ₃	H	H	PO(OCH ₃) ₂
Ial.38 or Ib1.38	CH ₃	H	H	PO(OCH ₂ CH ₃) ₂
Ial.39 or Ib1.39	CH ₃	H	H	PO(C ₆ H ₅) ₂
Ial.40 or Ib1.40	CH ₃	H	H	OCH ₃
Ial.41 or Ib1.41	CH ₃	H	H	OCH ₂ CH ₃
Ial.42 or Ib1.42	CH ₃	H	H	OCH ₂ C ₆ H ₅
Ial.43 or Ib1.43	CH ₃	H	H	OCH ₂ (2-furyl)
Ial.44 or Ib1.44	CH ₃	H	H	OCH ₂ (3-furyl)
Ial.45 or Ib1.45	CH ₃	H	H	OCOOCH ₃
Ial.46 or Ib1.46	CH ₃	H	H	OCOOCH ₂ CH ₃
Ial.47 or Ib1.47	CH ₃	H	H	OCOOCH(CH ₃) ₂
Ial.48 or Ib1.48	CH ₃	H	H	OCOOC ₆ H ₅
Ial.49 or Ib1.49	CH ₃	H	H	OCOOC(CH ₃) ₃
Ial.50 or Ib1.50	CH ₃	H	H	OCSOC ₆ H ₅
Ial.51 or Ib1.51	CH ₃	H	H	OCSN(CH ₃) ₂
Ial.52 or Ib1.52	CH ₃	H	H	OCON(CH ₃) ₂
Ial.53 or Ib1.53	CH ₃	H	H	OCOSCH ₃
Ial.54 or Ib1.54	CH ₃	H	H	ON(CH ₃) ₂
Ial.55 or Ib1.55	CH ₃	H	H	O-1-piperidyl
Ial.56 or Ib1.56	CH ₃	H	H	OCOCH ₃
Ial.57 or Ib1.57	CH ₃	H	H	OCOCH ₂ CH ₃
Ial.58 or Ib1.58	CH ₃	H	H	OCOCH(CH ₃) ₂
Ial.59 or Ib1.59	CH ₃	H	H	OCOC(CH ₃) ₃
Ial.60 or Ib1.60	CH ₃	H	H	OCO(CH ₂) ₆ CH ₃
Ial.61 or Ib1.61	CH ₃	H	H	OCO(CH ₂) ₇ CH ₃
Ial.62 or Ib1.62	CH ₃	H	H	OCO(CH ₂) ₁₆ CH ₃
Ial.63 or Ib1.63	CH ₃	H	H	OCO(CH ₂) ₁₄ CH ₃
Ial.64 or Ib1.64	CH ₃	H	H	OCOCH ₂ CH ₂ CH=CH ₂
Ial.65 or Ib1.65	CH ₃	H	H	OCO(CH ₂) ₃ O(2,4-Cl ₂ -C ₆ H ₃)
Ial.66 or Ib1.66	CH ₃	H	H	OCOCH(CH ₃)O-(2-CH ₃ -4-Cl-C ₆ H ₃)
Ial.67 or Ib1.67	CH ₃	H	H	OCOcyclopropyl
Ial.68 or Ib1.68	CH ₃	H	H	OCOcyclopentyl
Ial.69 or Ib1.69	CH ₃	H	H	OCOcyclohexyl
Ial.70 or Ib1.70	CH ₃	H	H	OCOC ₆ H ₅

No.	R ¹	R ²	R ³	R ⁵
Ial.71 or Ib1.71	CH ₃	H	H	OCO(2-tetrahydrofuryl)
Ial.72 or Ib1.72	CH ₃	H	H	OCO(2-furyl)
Ial.73 or Ib1.73	CH ₃	H	H	OCO(2-thienyl)
5 Ial.74 or Ib1.74	CH ₃	H	H	OCO(3-pyridyl)
Ial.75 or Ib1.75	CH ₃	H	H	OSO ₂ CH ₃
Ial.76 or Ib1.76	CH ₃	H	H	OSO ₂ CH ₂ CH ₃
Ial.77 or Ib1.77	F	H	H	F
10 Ial.78 or Ib1.78	F	H	H	Cl
Ial.79 or Ib1.79	F	H	H	Br
Ial.80 or Ib1.80	F	H	H	I
Ial.81 or Ib1.81	F	H	H	SCH ₃
15 Ial.82 or Ib1.82	F	H	H	SCH ₂ CH ₃
Ial.83 or Ib1.83	F	H	H	SCO(N(CH ₃) ₂) ₂
Ial.84 or Ib1.84	F	H	H	SO ₂ CH ₃
Ial.85 or Ib1.85	F	H	H	SO ₂ CH ₂ CH ₃
Ial.86 or Ib1.86	F	H	H	SC ₆ H ₅
20 Ial.87 or Ib1.87	F	H	H	S(4-CH ₃ -C ₆ H ₄)
Ial.88 or Ib1.88	F	H	H	S(4-Cl-C ₆ H ₄)
Ial.89 or Ib1.89	F	H	H	SO ₂ C ₆ H ₅
Ial.90 or Ib1.90	F	H	H	SO ₂ (4-CH ₃ -C ₆ H ₄)
25 Ial.91 or Ib1.91	F	H	H	SO ₂ (4-Cl-C ₆ H ₄)
Ial.92 or Ib1.92	F	H	H	4-morpholinyl
Ial.93 or Ib1.93	F	H	H	1-pyrrolidinyl
Ial.94 or Ib1.94	F	H	H	1-(1,2,4-triazolyl)
Ial.95 or Ib1.95	F	H	H	1-imidazolyl
30 Ial.96 or Ib1.96	F	H	H	1-pyrazolyl
Ial.97 or Ib1.97	F	H	H	4-oxo-1,4-dihydro-1-pyridyl
Ial.98 or Ib1.98	F	H	H	N(OCH ₃)CH ₃
Ial.99 or Ib1.99	F	H	H	2-tetrahydroisoxazolyl
35 Ial.100 or Ib1.100	F	H	H	N(CH ₃)N(CH ₃) ₂
Ial.101 or Ib1.101	F	H	H	N(CH ₂ CH=CH ₂)N(CH ₃) ₂
Ial.102 or Ib1.102	F	H	H	OPO(OCH ₃) ₂
Ial.103 or Ib1.103	F	H	H	OPO(N(CH ₃) ₂) ₂
40 Ial.104 or Ib1.104	F	H	H	OPO(OCH ₂ CH ₃) ₂
Ial.105 or Ib1.105	F	H	H	OPO(OC ₆ H ₅) ₂
Ial.106 or Ib1.106	F	H	H	OPO(CH ₃) ₂
Ial.107 or Ib1.107	F	H	H	OPO(CH ₂ CH ₃) ₂
Ial.108 or Ib1.108	F	H	H	OPO(C ₆ H ₅) ₂
45 Ial.109 or Ib1.109	F	H	H	OPS(OCH ₃) ₂
Ial.110 or Ib1.110	F	H	H	OPS(OCH ₂ CH ₃) ₂
Ial.111 or Ib1.111	F	H	H	OP(OCH ₃) ₂

No.	R ¹	R ²	R ³	R ⁵
Ial.112 or Ib1.112	F	H	H	OP(OCH ₂ CH ₃) ₂
Ial.113 or Ib1.113	F	H	H	PO(OCH ₃) ₂
Ial.114 or Ib1.114	F	H	H	PO(OCH ₂ CH ₃) ₂
Ial.115 or Ib1.115	F	H	H	PO(C ₆ H ₅) ₂
Ial.116 or Ib1.116	F	H	H	OCH ₃
Ial.117 or Ib1.117	F	H	H	OCH ₂ CH ₃
Ial.118 or Ib1.118	F	H	H	OCH ₂ C ₆ H ₅
Ial.119 or Ib1.119	F	H	H	OCH ₂ (2-furyl)
Ial.120 or Ib1.120	F	H	H	OCH ₂ (3-furyl)
Ial.121 or Ib1.121	F	H	H	OCOOCH ₃
Ial.122 or Ib1.122	F	H	H	OCOOCH ₂ CH ₃
Ial.123 or Ib1.123	F	H	H	OCOOCH(CH ₃) ₂
Ial.124 or Ib1.124	F	H	H	OCOOC ₆ H ₅
Ial.125 or Ib1.125	F	H	H	OCOOC(CH ₃) ₃
Ial.126 or Ib1.126	F	H	H	OCSOC ₆ H ₅
Ial.127 or Ib1.127	F	H	H	OCSN(CH ₃) ₂
Ial.128 or Ib1.128	F	H	H	OCON(CH ₃) ₂
Ial.129 or Ib1.129	F	H	H	OCOSCH ₃
Ial.130 or Ib1.130	F	H	H	ON(CH ₃) ₂
Ial.131 or Ib1.131	F	H	H	O-1-piperidyl
Ial.132 or Ib1.132	F	H	H	OCOCH ₃
Ial.133 or Ib1.133	F	H	H	OCOCH ₂ CH ₃
Ial.134 or Ib1.134	F	H	H	OCOCH(CH ₃) ₂
Ial.135 or Ib1.135	F	H	H	OCOC(CH ₃) ₃
Ial.136 or Ib1.136	F	H	H	OCO(CH ₂) ₆ CH ₃
Ial.137 or Ib1.137	F	H	H	OCO(CH ₂) ₇ CH ₃
Ial.138 or Ib1.138	F	H	H	OCO(CH ₂) ₁₆ CH ₃
Ial.139 or Ib1.139	F	H	H	OCO(CH ₂) ₁₄ CH ₃
Ial.140 or Ib1.140	F	H	H	OCOCH ₂ CH ₂ CH=CH ₂
Ial.141 or Ib1.141	F	H	H	OCO(CH ₂) ₃ O(2,4-Cl ₂ -C ₆ H ₃)
Ial.142 or Ib1.142	F	H	H	OCOCH(CH ₃)O-(2-CH ₃ -4-Cl-C ₆ H ₃)
Ial.143 or Ib1.143	F	H	H	OCOCyclopropyl
Ial.144 or Ib1.144	F	H	H	OCOCyclopentyl
Ial.145 or Ib1.145	F	H	H	OCOCyclohexyl
Ial.146 or Ib1.146	F	H	H	OCOC ₆ H ₅
Ial.147 or Ib1.147	F	H	H	OCO(2-tetrahydrofuryl)
Ial.148 or Ib1.148	F	H	H	OCO(2-furyl)
Ial.149 or Ib1.149	F	H	H	OCO(2-thienyl)
Ial.150 or Ib1.150	F	H	H	OCO(3-pyridyl)
Ial.151 or Ib1.151	F	H	H	OSO ₂ CH ₃
Ial.152 or Ib1.152	F	H	H	OSO ₂ CH ₂ CH ₃

No.	R ¹	R ²	R ³	R ⁵
Ial.153 or Ib1.153	CF ₃	H	H	F
Ial.154 or Ib1.154	CF ₃	H	H	Cl
Ial.155 or Ib1.155	CF ₃	H	H	Br
5 Ial.156 or Ib1.156	CF ₃	H	H	I
Ial.157 or Ib1.157	CF ₃	H	H	SCH ₃
Ial.158 or Ib1.158	CF ₃	H	H	SCH ₂ CH ₃
Ial.159 or Ib1.159	CF ₃	H	H	SCO(N(CH ₃) ₂) ₂
10 Ial.160 or Ib1.160	CF ₃	H	H	SO ₂ CH ₃
Ial.161 or Ib1.161	CF ₃	H	H	SO ₂ CH ₂ CH ₃
Ial.162 or Ib1.162	CF ₃	H	H	SC ₆ H ₅
Ial.163 or Ib1.163	CF ₃	H	H	S(4-CH ₃ -C ₆ H ₄)
Ial.164 or Ib1.164	CF ₃	H	H	S(4-Cl-C ₆ H ₄)
15 Ial.165 or Ib1.165	CF ₃	H	H	SO ₂ C ₆ H ₅
Ial.166 or Ib1.166	CF ₃	H	H	SO ₂ (4-CH ₃ -C ₆ H ₄)
Ial.167 or Ib1.167	CF ₃	H	H	SO ₂ (4-Cl-C ₆ H ₄)
Ial.168 or Ib1.168	CF ₃	H	H	4-morpholinyl
20 Ial.169 or Ib1.169	CF ₃	H	H	1-pyrrolidinyl
Ial.170 or Ib1.170	CF ₃	H	H	1-(1,2,4-triazolyl)
Ial.171 or Ib1.171	CF ₃	H	H	1-imidazolyl
Ial.172 or Ib1.172	CF ₃	H	H	1-pyrazolyl
25 Ial.173 or Ib1.173	CF ₃	H	H	4-oxo-1,4-dihydro-1-pyridyl
Ial.174 or Ib1.174	CF ₃	H	H	N(OCH ₃)CH ₃
Ial.175 or Ib1.175	CF ₃	H	H	2-tetrahydroisoxazolyl
Ial.176 or Ib1.176	CF ₃	H	H	N(CH ₃)N(CH ₃) ₂
30 Ial.177 or Ib1.177	CF ₃	H	H	N(CH ₂ CH=CH ₂)N(CH ₃) ₂
Ial.178 or Ib1.178	CF ₃	H	H	OPO(OCH ₃) ₂
Ial.179 or Ib1.179	CF ₃	H	H	OPO(OCH ₂ CH ₃) ₂
Ial.180 or Ib1.180	CF ₃	H	H	OPO(N(CH ₃) ₂) ₂
Ial.181 or Ib1.181	CF ₃	H	H	OPO(OC ₆ H ₅) ₂
35 Ial.182 or Ib1.182	CF ₃	H	H	OPO(CH ₃) ₂
Ial.183 or Ib1.183	CF ₃	H	H	OPO(CH ₂ CH ₃) ₂
Ial.184 or Ib1.184	CF ₃	H	H	OPO(C ₆ H ₅) ₂
Ial.185 or Ib1.185	CF ₃	H	H	OPS(OCH ₃) ₂
40 Ial.186 or Ib1.186	CF ₃	H	H	OPS(OCH ₂ CH ₃) ₂
Ial.187 or Ib1.187	CF ₃	H	H	OP(OCH ₃) ₂
Ial.188 or Ib1.188	CF ₃	H	H	OP(OCH ₂ CH ₃) ₂
Ial.189 or Ib1.189	CF ₃	H	H	PO(OCH ₃) ₂
Ial.190 or Ib1.190	CF ₃	H	H	PO(OCH ₂ CH ₃) ₂
45 Ial.191 or Ib1.191	CF ₃	H	H	PO(C ₆ H ₅) ₂
Ial.192 or Ib1.192	CF ₃	H	H	OCH ₃
Ial.193 or Ib1.193	CF ₃	H	H	OCH ₂ CH ₃

No.	R ¹	R ²	R ³	R ⁵
Ial.194 or Ib1.194	CF ₃	H	H	OCH ₂ C ₆ H ₅
Ial.195 or Ib1.195	CF ₃	H	H	OCH ₂ (2-furyl)
Ial.196 or Ib1.196	CF ₃	H	H	OCH ₂ (3-furyl)
5 Ial.197 or Ib1.197	CF ₃	H	H	OCOOCH ₃
Ial.198 or Ib1.198	CF ₃	H	H	OCOOCH ₂ CH ₃
Ial.199 or Ib1.199	CF ₃	H	H	OCOOCH(CH ₃) ₂
Ial.200 or Ib1.200	CF ₃	H	H	OCOOC ₆ H ₅
10 Ial.201 or Ib1.201	CF ₃	H	H	OCOOC(CH ₃) ₃
Ial.202 or Ib1.202	CF ₃	H	H	OCSOC ₆ H ₅
Ial.203 or Ib1.203	CF ₃	H	H	OCSN(CH ₃) ₂
Ial.204 or Ib1.204	CF ₃	H	H	OCON(CH ₃) ₂
Ial.205 or Ib1.205	CF ₃	H	H	OCOSCH ₃
15 Ial.206 or Ib1.206	CF ₃	H	H	ON(CH ₃) ₂
Ial.207 or Ib1.207	CF ₃	H	H	O-1-piperidyl
Ial.208 or Ib1.208	CF ₃	H	H	OCOCH ₃
Ial.209 or Ib1.209	CF ₃	H	H	OCOCH ₂ CH ₃
20 Ial.210 or Ib1.210	CF ₃	H	H	OCOCHC(CH ₃) ₂
Ial.211 or Ib1.211	CF ₃	H	H	OCOC(CH ₃) ₃
Ial.212 or Ib1.212	CF ₃	H	H	OCO(CH ₂) ₆ CH ₃
Ial.213 or Ib1.213	CF ₃	H	H	OCO(CH ₂) ₇ CH ₃
Ial.214 or Ib1.214	CF ₃	H	H	OCO(CH ₂) ₁₆ CH ₃
25 Ial.215 or Ib1.215	CF ₃	H	H	OCO(CH ₂) ₁₄ CH ₃
Ial.216 or Ib1.216	CF ₃	H	H	OCOCH ₂ CH ₂ CH=CH ₂
Ial.217 or Ib1.217	CF ₃	H	H	OCO(CH ₂) ₃ O(2,4-Cl ₂ -C ₆ H ₃)
Ial.218 or Ib1.218	CF ₃	H	H	OCOCH(CH ₃)O-(2-CH ₃ -4-Cl-C ₆ H ₃)
30 Ial.219 or Ib1.219	CF ₃	H	H	OCOcyclopropyl
Ial.220 or Ib1.220	CF ₃	H	H	OCOcyclopentyl
Ial.221 or Ib1.221	CF ₃	H	H	OCOcyclohexyl
Ial.222 or Ib1.222	CF ₃	H	H	OCOC ₆ H ₅
35 Ial.223 or Ib1.223	CF ₃	H	H	OCO(2-tetrahydrofuryl)
Ial.224 or Ib1.224	CF ₃	H	H	OCO(2-furyl)
Ial.225 or Ib1.225	CF ₃	H	H	OCO(2-thienyl)
Ial.226 or Ib1.226	CF ₃	H	H	OCO(3-pyridyl)
Ial.227 or Ib1.227	CF ₃	H	H	OSO ₂ CH ₃
40 Ial.228 or Ib1.228	CF ₃	H	H	OSO ₂ CH ₂ CH ₃
Ial.229 or Ib1.229	Cl	H	H	F
Ial.230 or Ib1.230	Cl	H	H	Cl
Ial.231 or Ib1.231	Cl	H	H	Br
45 Ial.232 or Ib1.232	Cl	H	H	I
Ial.233 or Ib1.233	Cl	H	H	SCH ₃
Ial.234 or Ib1.234	Cl	H	H	SCH ₂ CH ₃

No.	R ¹	R ²	R ³	R ⁵
Ial.235 or Ib1.235	Cl	H	H	SCO(N(CH ₃) ₂) ₂
Ial.236 or Ib1.236	Cl	H	H	SO ₂ CH ₃
Ial.237 or Ib1.237	Cl	H	H	SO ₂ CH ₂ CH ₃
5 Ial.238 or Ib1.238	Cl	H	H	SC ₆ H ₅
Ial.239 or Ib1.239	Cl	H	H	S(4-CH ₃ -C ₆ H ₄)
Ial.240 or Ib1.240	Cl	H	H	S(4-Cl-C ₆ H ₄)
Ial.241 or Ib1.241	Cl	H	H	SO ₂ C ₆ H ₅
10 Ial.242 or Ib1.242	Cl	H	H	SO ₂ (4-CH ₃ -C ₆ H ₄)
Ial.243 or Ib1.243	Cl	H	H	SO ₂ (4-Cl-C ₆ H ₄)
Ial.244 or Ib1.244	Cl	H	H	4-morpholinyl
Ial.245 or Ib1.245	Cl	H	H	1-pyrrolidinyl
Ial.246 or Ib1.246	Cl	H	H	1-(1,2,4-triazolyl)
15 Ial.247 or Ib1.247	Cl	H	H	1-imidazolyl
Ial.248 or Ib1.248	Cl	H	H	1-pyrazolyl
Ial.249 or Ib1.249	Cl	H	H	4-oxo-1,4-dihydro-1-pyridyl
20 Ial.250 or Ib1.250	Cl	H	H	N(OCH ₃)CH ₃
Ial.251 or Ib1.251	Cl	H	H	2-tetrahydroisoxazolyl
Ial.252 or Ib1.252	Cl	H	H	N(CH ₃)N(CH ₃) ₂
Ial.253 or Ib1.253	Cl	H	H	N(CH ₂ CH=CH ₂)N(CH ₃) ₂
Ial.254 or Ib1.254	Cl	H	H	OPO(OCH ₃) ₂
25 Ial.255 or Ib1.255	Cl	H	H	OPO(OCH ₂ CH ₃) ₂
Ial.256 or Ib1.256	Cl	H	H	OPO(N(CH ₃) ₂) ₂
Ial.257 or Ib1.257	Cl	H	H	OPO(OC ₆ H ₅) ₂
Ial.258 or Ib1.258	Cl	H	H	OPO(CH ₃) ₂
Ial.259 or Ib1.259	Cl	H	H	OPO(CH ₂ CH ₃) ₂
30 Ial.260 or Ib1.260	Cl	H	H	OPO(C ₆ H ₅) ₂
Ial.261 or Ib1.261	Cl	H	H	OPS(OCH ₃) ₂
Ial.262 or Ib1.262	Cl	H	H	OPS(OCH ₂ CH ₃) ₂
Ial.263 or Ib1.263	Cl	H	H	OP(OCH ₃) ₂
35 Ial.264 or Ib1.264	Cl	H	H	OP(OCH ₂ CH ₃) ₂
Ial.265 or Ib1.265	Cl	H	H	PO(OCH ₃) ₂
Ial.266 or Ib1.266	Cl	H	H	PO(OCH ₂ CH ₃) ₂
Ial.267 or Ib1.267	Cl	H	H	PO(C ₆ H ₅) ₂
40 Ial.268 or Ib1.268	Cl	H	H	OCH ₃
Ial.269 or Ib1.269	Cl	H	H	OCH ₂ CH ₃
Ial.270 or Ib1.270	Cl	H	H	OCH ₂ C ₆ H ₅
Ial.271 or Ib1.271	Cl	H	H	OCH ₂ (2-furyl)
Ial.272 or Ib1.272	Cl	H	H	OCH ₂ (3-furyl)
45 Ial.273 or Ib1.273	Cl	H	H	OCOOCH ₃
Ial.274 or Ib1.274	Cl	H	H	OCOOCH ₂ CH ₃
Ial.275 or Ib1.275	Cl	H	H	OCOOCH(CH ₃) ₂

No.	R ¹	R ²	R ³	R ⁵
Ial.276 or Ib1.276	Cl	H	H	OCOOC ₆ H ₅
Ial.277 or Ib1.277	Cl	H	H	OCOOC(CH ₃) ₃
Ial.278 or Ib1.278	Cl	H	H	OCSOC ₆ H ₅
Ial.279 or Ib1.279	Cl	H	H	OCSN(CH ₃) ₂
Ial.280 or Ib1.280	Cl	H	H	OCON(CH ₃) ₂
Ial.281 or Ib1.281	Cl	H	H	OCOSCH ₃
Ial.282 or Ib1.282	Cl	H	H	ON(CH ₃) ₂
Ial.283 or Ib1.283	Cl	H	H	O-1-piperidyl
Ial.284 or Ib1.284	Cl	H	H	OCOCH ₃
Ial.285 or Ib1.285	Cl	H	H	OCOCH ₂ CH ₃
Ial.286 or Ib1.286	Cl	H	H	OCOCH(CH ₃) ₂
Ial.287 or Ib1.287	Cl	H	H	OCOC(CH ₃) ₃
Ial.288 or Ib1.288	Cl	H	H	OCO(CH ₂) ₆ CH ₃
Ial.289 or Ib1.289	Cl	H	H	OCO(CH ₂) ₇ CH ₃
Ial.290 or Ib1.290	Cl	H	H	OCO(CH ₂) ₁₆ CH ₃
Ial.291 or Ib1.291	Cl	H	H	OCO(CH ₂) ₁₄ CH ₃
Ial.292 or Ib1.292	Cl	H	H	OCOCH ₂ CH ₂ CH=CH ₂
Ial.293 or Ib1.293	Cl	H	H	OCO(CH ₂) ₃ O(2,4-Cl ₂ -C ₆ H ₃)
Ial.294 or Ib1.294	Cl	H	H	OCOCH(CH ₃)-O-(2-CH ₃ -4-Cl-C ₆ H ₃)
Ial.295 or Ib1.295	Cl	H	H	OCOCyclopropyl
Ial.296 or Ib1.296	Cl	H	H	OCOCyclopentyl
Ial.297 or Ib1.297	Cl	H	H	OCOCyclohexyl
Ial.298 or Ib1.298	Cl	H	H	OCOC ₆ H ₅
Ial.299 or Ib1.299	Cl	H	H	OCO(2-tetrahydrofuryl)
Ial.300 or Ib1.300	Cl	H	H	OCO(2-furyl)
Ial.301 or Ib1.301	Cl	H	H	OCO(2-thienyl)
Ial.302 or Ib1.302	Cl	H	H	OCO(3-pyridyl)
Ial.303 or Ib1.303	Cl	H	H	OSO ₂ CH ₃
Ial.304 or Ib1.304	Cl	H	H	OSO ₂ CH ₂ CH ₃
Ial.305 or Ib1.305	CHF ₂	H	H	F
Ial.306 or Ib1.306	CHF ₂	H	H	Cl
Ial.307 or Ib1.307	CHF ₂	H	H	Br
Ial.308 or Ib1.308	CHF ₂	H	H	I
Ial.309 or Ib1.309	CHF ₂	H	H	SCH ₃
Ial.310 or Ib1.310	CHF ₂	H	H	SCH ₂ CH ₃
Ial.311 or Ib1.311	CHF ₂	H	H	SCO(N(CH ₃) ₂) ₂
Ial.312 or Ib1.312	CHF ₂	H	H	SO ₂ CH ₃
Ial.313 or Ib1.313	CHF ₂	H	H	SO ₂ CH ₂ CH ₃
Ial.314 or Ib1.314	CHF ₂	H	H	SC ₆ H ₅
Ial.315 or Ib1.315	CHF ₂	H	H	S(4-CH ₃ -C ₆ H ₄)
Ial.316 or Ib1.316	CHF ₂	H	H	S(4-Cl-C ₆ H ₄)

No.	R ¹	R ²	R ³	R ⁵
Ia1.317 or Ib1.317	CHF ₂	H	H	SO ₂ C ₆ H ₅
Ia1.318 or Ib1.318	CHF ₂	H	H	SO ₂ (4-CH ₃ -C ₆ H ₄)
Ia1.319 or Ib1.319	CHF ₂	H	H	SO ₂ (4-Cl-C ₆ H ₄)
5 Ia1.320 or Ib1.320	CHF ₂	H	H	4-morpholinyl
Ia1.321 or Ib1.321	CHF ₂	H	H	1-pyrrolidinyl
Ia1.322 or Ib1.322	CHF ₂	H	H	1-(1,2,4-triazolyl)
Ia1.323 or Ib1.323	CHF ₂	H	H	1-imidazolyl
10 Ia1.324 or Ib1.324	CHF ₂	H	H	1-pyrazolyl
Ia1.325 or Ib1.325	CHF ₂	H	H	4-oxo-1,4-dihydro-1-pyridyl
Ia1.326 or Ib1.326	CHF ₂	H	H	N(OCH ₃)CH ₃
Ia1.327 or Ib1.327	CHF ₂	H	H	2-tetrahydroisoxazolyl
15 Ia1.328 or Ib1.328	CHF ₂	H	H	N(CH ₃)N(CH ₃) ₃
Ia1.329 or Ib1.329	CHF ₂	H	H	N(CH ₂ CH=CH ₂)N(CH ₃) ₂
Ia1.330 or Ib1.330	CHF ₂	H	H	OPO(OCH ₃) ₂
Ia1.331 or Ib1.331	CHF ₂	H	H	OPO(OCH ₂ CH ₃) ₂
20 Ia1.332 or Ib1.332	CHF ₂	H	H	OPO(N(CH ₃) ₂) ₂
Ia1.333 or Ib1.333	CHF ₂	H	H	OPO(OC ₆ H ₅) ₂
Ia1.334 or Ib1.334	CHF ₂	H	H	OPO(CH ₃) ₂
Ia1.335 or Ib1.335	CHF ₂	H	H	OPO(CH ₂ CH ₃) ₂
Ia1.336 or Ib1.336	CHF ₂	H	H	OPO(C ₆ H ₅) ₂
25 Ia1.337 or Ib1.337	CHF ₂	H	H	OPS(OCH ₃) ₂
Ia1.338 or Ib1.338	CHF ₂	H	H	OPS(OCH ₂ CH ₃) ₂
Ia1.339 or Ib1.339	CHF ₂	H	H	OP(OCH ₃) ₂
Ia1.340 or Ib1.340	CHF ₂	H	H	OP(OCH ₂ CH ₃) ₂
Ia1.341 or Ib1.341	CHF ₂	H	H	PO(OCH ₃) ₂
30 Ia1.342 or Ib1.342	CHF ₂	H	H	PO(OCH ₂ CH ₃) ₂
Ia1.343 or Ib1.343	CHF ₂	H	H	PO(C ₆ H ₅) ₂
Ia1.344 or Ib1.344	CHF ₂	H	H	OCH ₃
Ia1.345 or Ib1.345	CHF ₂	H	H	OCH ₂ CH ₃
35 Ia1.346 or Ib1.346	CHF ₂	H	H	OCH ₂ C ₆ H ₅
Ia1.347 or Ib1.347	CHF ₂	H	H	OCH ₂ (2-furyl)
Ia1.348 or Ib1.348	CHF ₂	H	H	OCH ₂ (3-furyl)
Ia1.349 or Ib1.349	CHF ₂	H	H	OCOOCH ₃
Ia1.350 or Ib1.350	CHF ₂	H	H	OCOOCH ₂ CH ₃
40 Ia1.351 or Ib1.351	CHF ₂	H	H	OCOOCH(CH ₃) ₂
Ia1.352 or Ib1.352	CHF ₂	H	H	OCOOOC ₆ H ₅
Ia1.353 or Ib1.353	CHF ₂	H	H	OCOO(C ₆ H ₅) ₃
Ia1.354 or Ib1.354	CHF ₂	H	H	OCSOC ₆ H ₅
45 Ia1.355 or Ib1.355	CHF ₂	H	H	OCSN(CH ₃) ₂
Ia1.356 or Ib1.356	CHF ₂	H	H	OCON(CH ₃) ₂
Ia1.357 or Ib1.357	CHF ₂	H	H	OCOSCH ₃

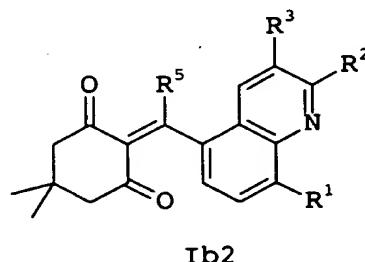
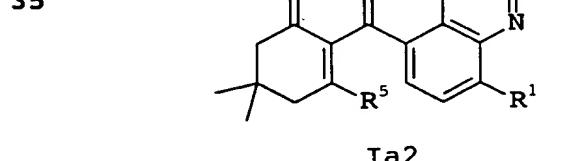
No.	R ¹	R ²	R ³	R ⁵
Ia1.358 or Ib1.358	CHF ₂	H	H	ON(CH ₃) ₂
Ia1.359 or Ib1.359	CHF ₂	H	H	O-1-piperidyl
Ia1.360 or Ib1.360	CHF ₂	H	H	OCOCH ₃
5 Ia1.361 or Ib1.361	CHF ₂	H	H	OCOCH ₂ CH ₃
Ia1.362 or Ib1.362	CHF ₂	H	H	OCOCH(CH ₃) ₂
Ia1.363 or Ib1.363	CHF ₂	H	H	OCOC(CH ₃) ₃
Ia1.364 or Ib1.364	CHF ₂	H	H	OCO(CH ₂) ₆ CH ₃
10 Ia1.365 or Ib1.365	CHF ₂	H	H	OCO(CH ₂) ₇ CH ₃
Ia1.366 or Ib1.366	CHF ₂	H	H	OCO(CH ₂) ₁₆ CH ₃
Ia1.367 or Ib1.367	CHF ₂	H	H	OCO(CH ₂) ₁₄ CH ₃
Ia1.368 or Ib1.368	CHF ₂	H	H	OCOCH ₂ CH ₂ CH=CH ₂
Ia1.369 or Ib1.369	CHF ₂	H	H	OCO(CH ₂) ₃ O(2,4-Cl ₂ -C ₆ H ₃)
15 Ia1.370 or Ib1.370	CHF ₂	H	H	OCOCH(CH ₃)O-(2-CH ₃ -4-Cl-C ₆ H ₃)
Ia1.371 or Ib1.371	CHF ₂	H	H	OCOcyclopropyl
Ia1.372 or Ib1.372	CHF ₂	H	H	OCOcyclopentyl
20 Ia1.373 or Ib1.373	CHF ₂	H	H	OCOcyclohexyl
Ia1.374 or Ib1.374	CHF ₂	H	H	OCOC ₆ H ₅
Ia1.375 or Ib1.375	CHF ₂	H	H	OCO(2-tetrahydrofuryl)
Ia1.376 or Ib1.376	CHF ₂	H	H	OCO(2-furyl)
Ia1.377 or Ib1.377	CHF ₂	H	H	OCO(2-thienyl)
25 Ia1.378 or Ib1.378	CHF ₂	H	H	OCO(3-pyridyl)
Ia1.379 or Ib1.379	CHF ₂	H	H	OSO ₂ CH ₃
Ia1.380 or Ib1.380	CHF ₂	H	H	OSO ₂ CH ₂ CH ₃
Ia1.381 or Ib1.381	Cl	CH ₃	H	F
Ia1.382 or Ib1.382	Cl	CH ₃	H	Cl
30 Ia1.383 or Ib1.383	Cl	CH ₃	H	Br
Ia1.384 or Ib1.384	Cl	CH ₃	H	I
Ia1.385 or Ib1.385	Cl	CH ₃	H	SCH ₃
Ia1.386 or Ib1.386	Cl	CH ₃	H	SCH ₂ CH ₃
35 Ia1.387 or Ib1.387	Cl	CH ₃	H	SCO(N(CH ₃) ₂) ₂
Ia1.388 or Ib1.388	Cl	CH ₃	H	SO ₂ CH ₃
Ia1.389 or Ib1.389	Cl	CH ₃	H	SO ₂ CH ₂ CH ₃
Ia1.390 or Ib1.390	Cl	CH ₃	H	SC ₆ H ₅
40 Ia1.391 or Ib1.391	Cl	CH ₃	H	S(4-CH ₃ -C ₆ H ₄)
Ia1.392 or Ib1.392	Cl	CH ₃	H	S(4-Cl-C ₆ H ₄)
Ia1.393 or Ib1.393	Cl	CH ₃	H	SO ₂ C ₆ H ₅
Ia1.394 or Ib1.394	Cl	CH ₃	H	SO ₂ (4-CH ₃ -C ₆ H ₄)
Ia1.395 or Ib1.395	Cl	CH ₃	H	SO ₂ (4-Cl-C ₆ H ₄)
45 Ia1.396 or Ib1.396	Cl	CH ₃	H	4-morpholinyl
Ia1.397 or Ib1.397	Cl	CH ₃	H	1-pyrrolidinyl
Ia1.398 or Ib1.398	Cl	CH ₃	H	1-(1,2,4-triazolyl)

No.	R ¹	R ²	R ³	R ⁵
Ial.399 or Ib1.399	Cl	CH ₃	H	1-imidazolyl
Ial.400 or Ib1.400	Cl	CH ₃	H	1-pyrazolyl
5 Ial.401 or Ib1.401	Cl	CH ₃	H	4-oxo-1,4-dihydro-1-pyridyl
Ial.402 or Ib1.402	Cl	CH ₃	H	N(OCH ₃)CH ₃
Ial.403 or Ib1.403	Cl	CH ₃	H	2-tetrahydroisoxazolyl
Ial.404 or Ib1.404	Cl	CH ₃	H	N(CH ₃)N(CH ₃) ₂
10 Ial.405 or Ib1.405	Cl	CH ₃	H	N(CH ₂ CH=CH ₂)N(CH ₃) ₂
Ial.406 or Ib1.406	Cl	CH ₃	H	OPO(OCH ₃) ₂
Ial.407 or Ib1.407	Cl	CH ₃	H	OPO(OCH ₂ CH ₃) ₂
Ial.408 or Ib1.408	Cl	CH ₃	H	OPO(N(CH ₃) ₂) ₂
Ial.409 or Ib1.409	Cl	CH ₃	H	OPO(OC ₆ H ₅) ₂
15 Ial.410 or Ib1.410	Cl	CH ₃	H	OPO(CH ₃) ₂
Ial.411 or Ib1.411	Cl	CH ₃	H	OPO(CH ₂ CH ₃) ₂
Ial.412 or Ib1.412	Cl	CH ₃	H	OPO(C ₆ H ₅) ₂
Ial.413 or Ib1.413	Cl	CH ₃	H	OPS(OCH ₃) ₂
20 Ial.414 or Ib1.414	Cl	CH ₃	H	OPS(OCH ₂ CH ₃) ₂
Ial.415 or Ib1.415	Cl	CH ₃	H	OP(OCH ₃) ₂
Ial.416 or Ib1.416	Cl	CH ₃	H	OP(OCH ₂ CH ₃) ₂
Ial.417 or Ib1.417	Cl	CH ₃	H	PO(OCH ₃) ₂
Ial.418 or Ib1.418	Cl	CH ₃	H	PO(OCH ₂ CH ₃) ₂
25 Ial.419 or Ib1.419	Cl	CH ₃	H	PO(C ₆ H ₅) ₂
Ial.420 or Ib1.420	Cl	CH ₃	H	OCH ₃
Ial.421 or Ib1.421	Cl	CH ₃	H	OCH ₂ CH ₃
Ial.422 or Ib1.422	Cl	CH ₃	H	OCH ₂ C ₆ H ₅
Ial.423 or Ib1.423	Cl	CH ₃	H	OCH ₂ (2-furyl)
30 Ial.424 or Ib1.424	Cl	CH ₃	H	OCH ₂ (3-furyl)
Ial.425 or Ib1.425	Cl	CH ₃	H	OCOOCH ₃
Ial.426 or Ib1.426	Cl	CH ₃	H	OCOOCH ₂ CH ₃
Ial.427 or Ib1.427	Cl	CH ₃	H	OCOOCH(CH ₃) ₂
35 Ial.428 or Ib1.428	Cl	CH ₃	H	OCOOOC ₆ H ₅
Ial.429 or Ib1.429	Cl	CH ₃	H	OCOOC(CH ₃) ₃
Ial.430 or Ib1.430	Cl	CH ₃	H	OCSOC ₆ H ₅
Ial.431 or Ib1.431	Cl	CH ₃	H	OCSN(CH ₃) ₂
40 Ial.432 or Ib1.432	Cl	CH ₃	H	OCON(CH ₃) ₂
Ial.433 or Ib1.433	Cl	CH ₃	H	OCOSCH ₃
Ial.434 or Ib1.434	Cl	CH ₃	H	ON(CH ₃) ₂
Ial.435 or Ib1.435	Cl	CH ₃	H	O-1-piperidyl
Ial.436 or Ib1.436	Cl	CH ₃	H	OCOCH ₃
45 Ial.437 or Ib1.437	Cl	CH ₃	H	OCOCH ₂ CH ₃
Ial.438 or Ib1.438	Cl	CH ₃	H	OCOCH(CH ₃) ₂
Ial.439 or Ib1.439	Cl	CH ₃	H	OCOC(CH ₃) ₃

No.	R ¹	R ²	R ³	R ⁵
Ial.440 or Ib1.440	Cl	CH ₃	H	OCO(CH ₂) ₆ CH ₃
Ial.441 or Ib1.441	Cl	CH ₃	H	OCO(CH ₂) ₇ CH ₃
Ial.442 or Ib1.442	Cl	CH ₃	H	OCO(CH ₂) ₁₆ CH ₃
Ial.443 or Ib1.443	Cl	CH ₃	H	OCO(CH ₂) ₁₄ CH ₃
Ial.444 or Ib1.444	Cl	CH ₃	H	OCOCH ₂ CH ₂ CH=CH ₂
Ial.445 or Ib1.445	Cl	CH ₃	H	OCO(CH ₂) ₃ O(2,4-Cl ₂ -C ₆ H ₃)
Ial.446 or Ib1.446	Cl	CH ₃	H	OCOCH(CH ₃)O-(2-CH ₃ -4-Cl-C ₆ H ₃)
Ial.447 or Ib1.447	Cl	CH ₃	H	OCOCyclopropyl
Ial.448 or Ib1.448	Cl	CH ₃	H	OCOCyclopentyl
Ial.449 or Ib1.449	Cl	CH ₃	H	OCOCyclohexyl
Ial.450 or Ib1.450	Cl	CH ₃	H	OCOC ₆ H ₅
Ial.451 or Ib1.451	Cl	CH ₃	H	OCO(2-tetrahydrofuryl)
Ial.452 or Ib1.452	Cl	CH ₃	H	OCO(2-furyl)
Ial.453 or Ib1.453	Cl	CH ₃	H	OCO(2-thienyl)
Ial.454 or Ib1.454	Cl	CH ₃	H	OCO(3-pyridyl)
Ial.455 or Ib1.455	Cl	CH ₃	H	OSO ₂ CH ₃
Ial.456 or Ib1.456	Cl	CH ₃	H	OSO ₂ CH ₂ CH ₃

Extraordinary preference is furthermore given to the following cyclohexenonequinolinoyl derivatives of the formula I:

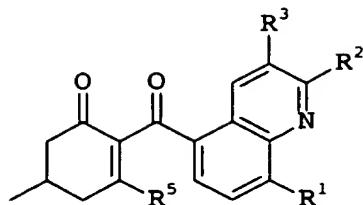
- the compounds of the formulae Ia2 and Ib2, in particular the compounds Ia2.1 to Ia2.456 and the compounds Ib2.1 to Ib2.456, which differ from the compounds Ial.1 to Ial.456 and Ib1.1 to Ib1.456, respectively, in that (R⁶)₁ is "5,5-dimethyl".



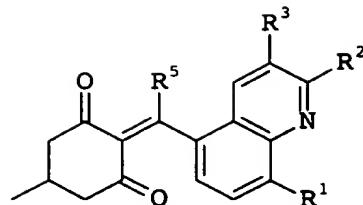
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- the compounds of the formulae Ia3 and Ib3, in particular the compounds Ia3.1 to Ia3.456 and the compounds Ib3.1 to Ib3.456, which differ from the compounds Ial.1 to Ial.456 and Ib1.1 to Ib1.456, respectively, in that (R⁶)₁ is "5-methyl".

5



Ia3

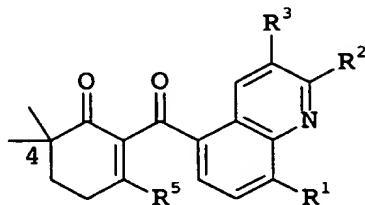


Ib3

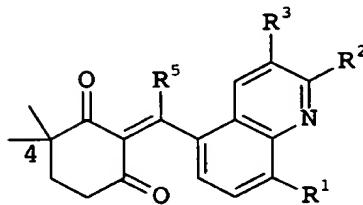
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- the compounds of the formulae Ia4 and Ib4, in particular the compounds Ia4.1 to Ia4.456 and the compounds Ib4.1 to Ib4.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that (R⁶)₁ is "4,4-dimethyl".

20



Ia4



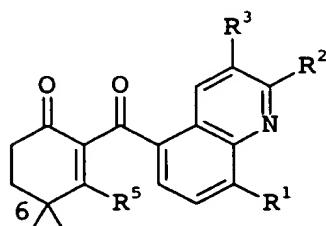
Ib4

25

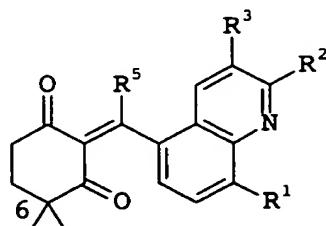
- the compounds of the formulae Ia5 and Ib5, in particular the compounds Ia5.1 to Ia5.456 and the compounds Ib5.1 to Ib5.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that (R⁶)₁ is "6,6-dimethyl".

35

40



Ia5



Ib5

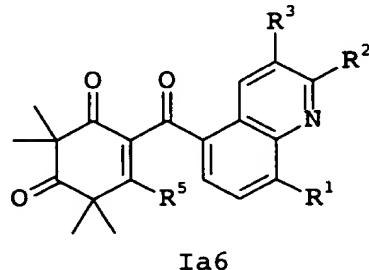
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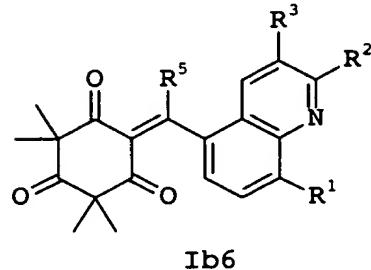
- the compounds of the formulae Ia6 and Ib6, in particular the compounds Ia6.1 to Ia6.456 and the compounds Ib6.1 to Ib6.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that $(R^6)_1$ is "4,4,6,6-tetramethyl-5-oxo".

5

10



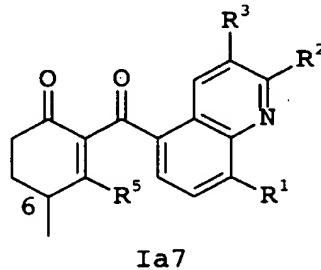
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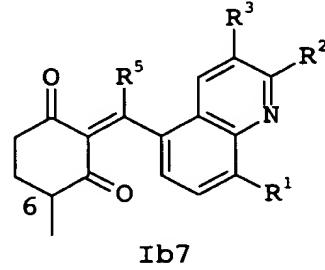
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- the compounds of the formulae Ia7 and Ib7, in particular the compounds Ia7.1 to Ia7.456 and the compounds Ib7.1 to Ib7.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that $(R^6)_1$ is "6-methyl".

25



30

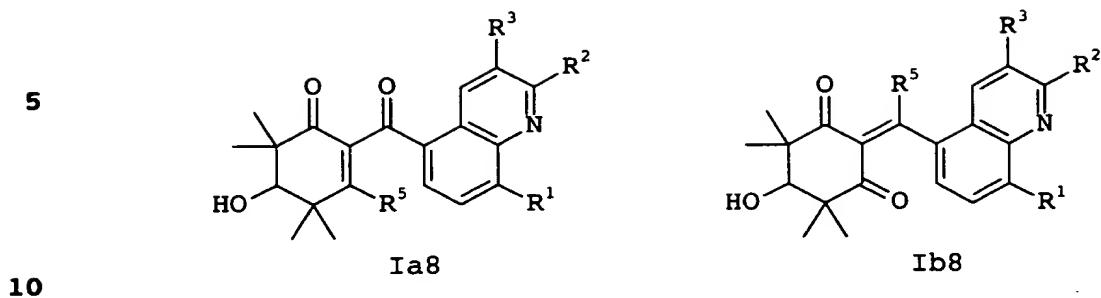


35

- the compounds of the formulae Ia8 and Ib8, in particular the compounds Ia8.1 to Ia8.456 and the compounds Ib8.1 to Ib8.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that $(R^6)_1$ is "5-hydroxy-4,4,6,6-tetramethyl".

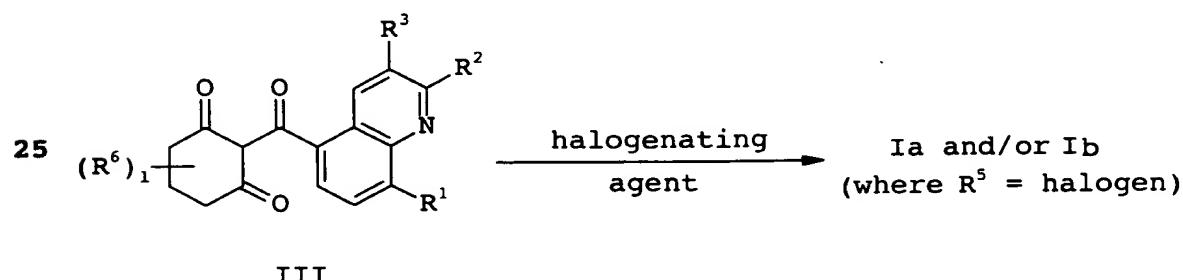
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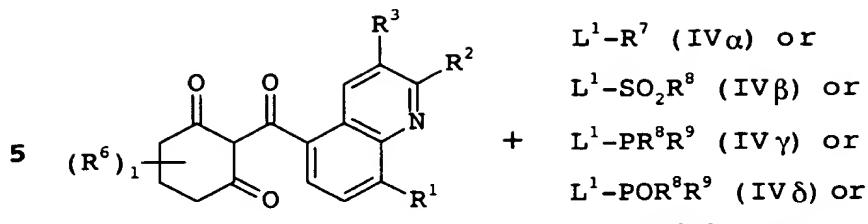
15 The cyclohexenonequinolinoyl derivatives of the formula I can be obtained by various routes, for example by the following processes:

20 A. Preparation of compounds of the formula I where R^5 = halogen by reaction of cyclohexanedione derivatives of the formula III with halogenating agents:



35 Suitable halogenating agents are, for example, phosgene, diphosgene, triphosgene, thionyl chloride, oxalyl chloride, phosphorus chloride, phosphorus pentachloride, mesyl chloride, chloromethylene-*N,N*-dimethylammonium chloride, oxalyl bromide, phosphorus oxybromide etc.

40 B. Preparation of compounds of the formula I where R^5 = OR^7 , OSO_2R^8 , OPR^8R^9 , $OPOR^8R^9$ or $OPSR^8R^9$ by reaction of cyclohexane dione derivatives of the formula III with alkylating, sulfonylating or phosphorylating agents IV α , IV β , IV γ , IV δ or IV ε .



HOR⁷ (V α) or
 HSR⁷ (V β) or
 HPOR⁸R⁹ (V γ) or
 5 Ia and/or Ib + HNR¹⁰R¹¹ (V δ) or
 where R⁵ = halogen, OSO₂R⁸) HONR¹¹R¹² (V ϵ) or
 H(N-linked
 heterocycl) (V η) or
 10 H(ON-linked
 heterocycl) (V θ)
 ↓
 15 Ia and/or Ib
 (where R⁵ = OR⁷, SR⁷,
 POR⁸R⁹, NR¹⁰R¹¹,
 ONR¹¹R¹²,
 N-linked
 heterocycl or
 ON-linked
 heterocycl)
 20

D. Preparation of compounds of the formula I where R⁵ = SOR⁸, SO₂R⁸ by reaction of compounds of the formula I where R⁵ = SR⁸ (I β) with an oxidizing agent.

25 Ia and/or Ib oxidizing agent Ia and/or Ib
 (where R⁵ = SR⁸) (where R⁵ = SOR⁸ or SO₂R⁸)

30 Suitable oxidizing agents are, for example,
 m-chloroperbenzoic acid, peroxy acetic acid, trifluoroperoxy
 acetic acid, hydrogen peroxide, if appropriate in the
 presence of a catalyst such as tungstate.

35 The following conditions apply to the abovementioned reactions:
 The starting materials are generally employed in equimolar
 amounts. However, it will also be advantageous to employ an
 40 excess of one or the other component.

If appropriate, it may be advantageous to carry out the reactions
 in the presence of a base. Here, the starting materials and the
 base are advantageously employed in equimolar amounts. An excess
 45 of base, for example 1.5 to 3 molar equivalents, based on Ia

and/or Ib (where R^5 = halogen or OSO_2R^8) or III may in certain cases be advantageous.

Suitable bases are tertiary alkyl amines, such as triethylamine,
5 aromatic amines, such as pyridine, alkali metal carbonates, for example sodium carbonate or potassium carbonate, alkali metal bicarbonates, such as sodium bicarbonate and potassium bicarbonate, alkali metal alkoxides, such as sodium methoxide, sodium ethoxide, potassium tert-butoxide or alkali metal 10 hydrides, for example sodium hydride. Preference is given to using triethylamine or pyridine.

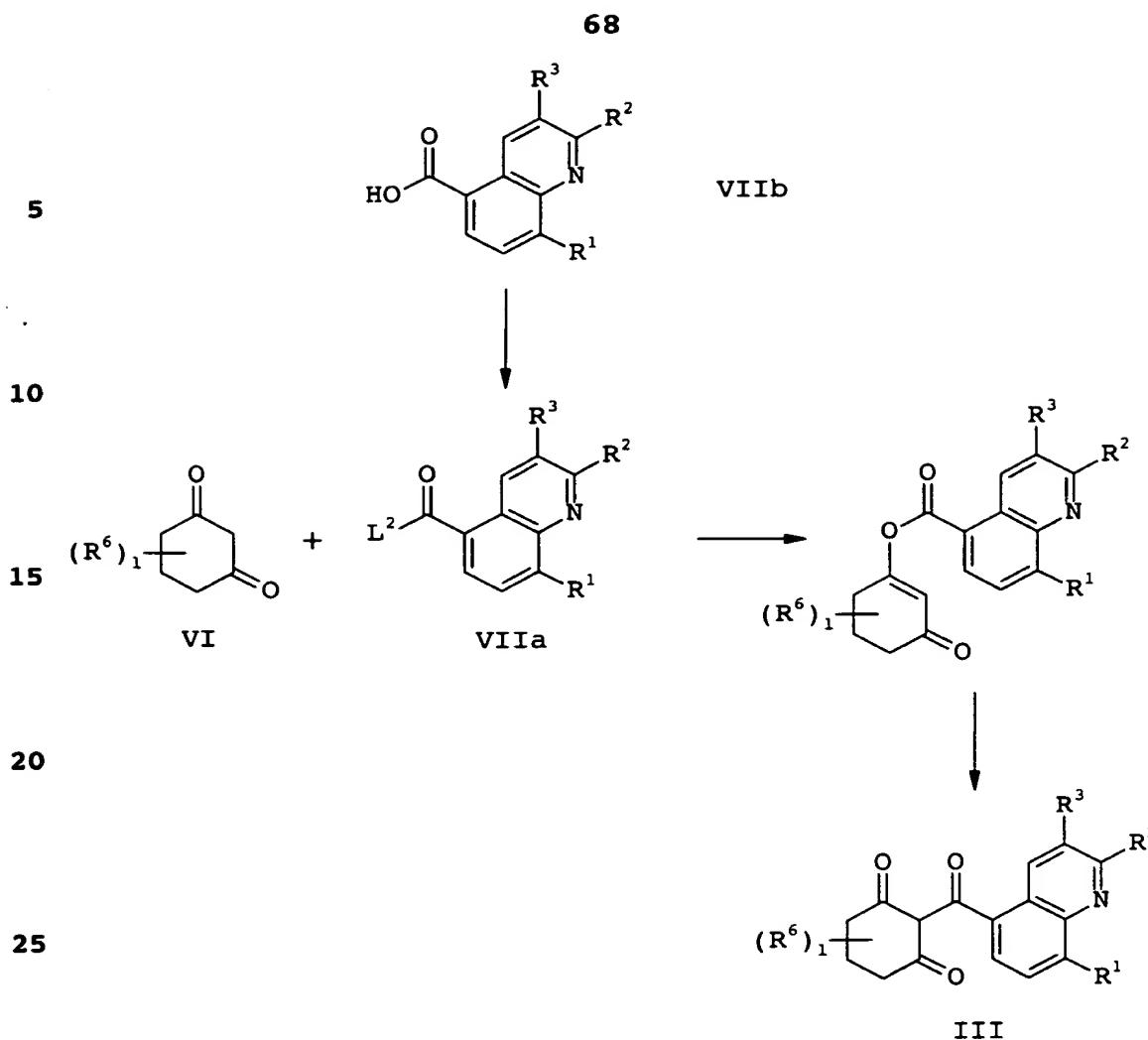
Suitable solvents are, for example, chlorinated hydrocarbons, such as methylene chloride or 1,2-dichloroethane, aromatic 15 hydrocarbons, for example toluene, xylene or chlorobenzene, ethers, such as diethyl ether, methyl-tert-butyl ether, tetrahydrofuran or dioxane, polar aprotic solvents, such as acetonitrile, dimethyl formamide or dimethyl sulfoxide, or 20 esters, such as ethyl acetate, or mixtures of these.

The reaction temperature is generally in the range of from 0°C to the boiling point of the reaction mixture.

25 Work-up to give the product can be carried out in a manner known per se.

Depending on the reaction conditions, the compounds Ia, Ib or mixtures of these can be formed. The latter can be separated by 30 classical separation methods, such as, for example, crystallization, chromatography, etc.

The cyclohexanedione derivatives of the formula III are known or 35 can be prepared by processes known per se (for example DE-A 19 532 311), for example by reacting cyclohexanones of the formula VI with an activated benzoic acid VIIa or a benzoic acid VIIb, which is preferably activated in situ, to give the acylation product which is subsequently rearranged.



30 L^2 is a nucleophilically replaceable leaving group, such as halogen, for example bromine or chlorine, hetaryl, for example imidazolyl or pyridyl, carboxylate, for example acetate or trifluoroacetate, etc.

35 The activated benzoic acid VIIa can be employed directly, such as in the case of the benzoyl halides, or be generated in situ, for example using dicyclohexyl carbodiimide, triphenylphosphine/azodicarboxylic ester, 2-pyridine disulfide/triphenyl phosphine, carbonyldiimidazole, etc.

40

If appropriate, it may be advantageous to carry out the acylation reaction in the presence of a base. Here, the starting materials and the auxiliary base are advantageously employed in equimolar amounts. A slight excess of the auxiliary base, for example from 45 1.2 to 1.5 molar equivalents, based on VII, may be advantageous in certain cases.

Suitable auxiliary bases are tertiary alkyl amines, pyridine or alkali metal carbonates. Suitable solvents are, for example, chlorinated hydrocarbons, such as methylene chloride or 1,2-dichloroethane, aromatic hydrocarbons, such as toluene, 5 xylene or chlorobenzene, ethers, such as diethyl ether, methyl tert-butyl ether, tetrahydrofuran or dioxane, polar aprotic solvents, such as acetonitrile, dimethylformamide or dimethyl sulfoxide, or esters, such as ethyl acetate, or mixtures of these.

10

If the activated carboxylic acid component employed is a benzoyl halide, it may be advantageous to cool the reaction mixture to 0–10°C on addition of this reaction partner. The mixture is subsequently stirred at 20 – 100°C, preferably at 25 – 50°C, until 15 the reaction is complete. Work-up is carried out in a customary manner, for example the reaction mixture is poured into water and the product of value is extracted. Solvents which are suitable for this purpose are, in particular, methylene chloride, diethyl ether and ethyl acetate. The organic phase is dried and the 20 solvent is removed, after which the crude ester can be employed without any further purification for the rearrangement.

The rearrangement of the esters to the compounds of the formula III is advantageously carried out at 20 – 100°C in a solvent and 25 in the presence of a base and, if appropriate, with the aid of a cyano compound as catalyst.

Suitable solvents are, for example, acetonitrile, methylene 30 chloride, 1,2-dichloroethane, dioxane, ethyl acetate, toluene or mixtures of these. Preferred solvents are acetonitrile and dioxane.

Suitable bases are tertiary amines, such as triethylamine, 35 aromatic amines, such as pyridine, or alkali metal carbonates, such as sodium carbonate or potassium carbonate, which are preferably employed in an equimolar amount, or up to a four-fold excess, based on the ester. Preference is given to using triethylamine or alkali metal carbonate, preferably in twice the 40 equimolar amount, based on the ester.

Suitable cyano compounds are inorganic cyanides, such as sodium 45 cyanide or potassium cyanide, and organic cyano compounds, such as acetone cyanohydrin or trimethylsilyl cyanide. They are employed in an amount from 1 to 50 mol percent, based on the ester. Preference is given to using acetone cyanohydrin or

trimethylsilyl cyanide, for example in an amount from 5 to 15, preferably 10, mol percent, based on the ester.

Work-up can be carried out in a manner known per se. For example,

5 the reaction mixture is acidified with dilute mineral acid, such as 5% strength hydrochloric acid, or sulfuric acid, and extracted with an organic solvent, for example methylene chloride or ethyl acetate. The organic extract can be extracted with 5-10% strength alkali metal carbonate solution, for example sodium carbonate or

10 potassium carbonate solution. The aqueous phase is acidified and the resulting precipitate is filtered off with suction and/or extracted with methylene chloride or ethyl acetate, dried and concentrated.

15 The benzoyl halides of the formula VIIa (where $L^2 = Cl, Br$) can be prepared in a manner known per se by reaction of the benzoic acids of the formula VIIb with halogenating agents, such as thionyl chloride, thionyl bromide, phosgene, diphosgene, triphosgene, oxalyl chloride, oxalyl bromide.

20

The benzoic acids of the formula VIIb can be prepared in a known manner from the corresponding esters by acidic or basic hydrolysis. The latter are known from the literature or can be

25 prepared in a manner known per se.

8-Difluoromethyl-5-alkoxycarbonyl-quinolines can be obtained from the corresponding 8-aldehyde derivatives by fluorination. A suitable fluorinating agent is, inter alia, DAST. The formyl

30 quinoline is obtained by oxidation of the corresponding bromomethyl quinoline.

Furthermore, it is possible to obtain

35 8-difluoromethoxy-5-alkoxycarbonyl-quinolines from the corresponding 8-hydroxy derivatives by reaction with chlorodifluoromethane. This reaction is preferably carried out in the presence of a base, such as potassium hydroxide or sodium hydroxide, in an aprotic solvent. The

40 8-hydroxy-5-alkoxycarbonylquinolines are obtained from 8-hydroxy-5-hydroxycarbonyl-quinoline by esterification reactions which are known per se.

Preparation examples:

2-[(8-Chloroquinolin-5-yl)carbonyl]-1-chloro-4,4,6,6-tetramethylcyclohex-1-ene-3,5-dione (Compound 2.22) and

5 2-[(8-chloroquinolin-5-yl)chloromethylidene]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione (Compound 3.1)

10 4.0 g (10.8 mmol) of 2-(8-chloroquinolin-5-yl)carbonyl-4,4,6,6-tetramethylcyclohexane-1,3,5-trione were dissolved in 40 ml of dichloromethane, and 4.1 g (32.4 mmol) of oxalyl chloride and 1.5 ml of dimethylformamide were added. The mixture was stirred at 25°C for 1.5 hours, after which the solvent was removed. This gave 3.9 g of colorless crystals. Silica gel chromatography (mobile phase: toluene/methyl-tert-butyl ether) gave:

15 2-[(8-chloroquinolin-5-yl)carbonyl]-1-chloro-4,4,6,6-tetramethylcyclohex-1-ene-3,5-dione: Yield 0.65 g (colorless crystals); m.p.: 180°C;

20 2-[(8-chloroquinolin-5-yl)chloromethylidene]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione: Yield: 0.35 g (colorless crystals); m.p.: 156°C.

25 2-[(8-Chloroquinolin-5-yl)-1-(4'-oxo-1',4'-dihydropyrid-1'-yl)-4,4,6,6-tetramethylcyclohex-1-ene-3,5-dione (Compound 2.46) and 2-[(8-chloroquinolin-5-yl)-(4'-oxo-1',4'-dihydropyrid-1'-yl)-methylidene]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione (Compound 3.5)

30 1.0 g (2.6 mmol) of a mixture of the compounds 2.22 and 3.1 was dissolved in 25 ml of methylene chloride, 0.82 g (8.7 mmol) of 4-hydroxypyridine were added and the mixture was stirred at 40°C for 8 hours. Insoluble components were subsequently filtered off, the solvent was removed and the residue was chromatographed over 35 silica gel (mobile phase: methylene chloride/methanol). This gave: 2-[(8-chloroquinolin-5-yl)-4'-oxo-1',4'-dihydropyridin-1'-yl)methylidene]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione: Yield 0.40 g (colorless oil); 2-[(8-chloroquinolin-5-yl)carbonyl]-1-(4'-oxo-1',4'-dihydro-40 pyrid-1'-yl)-4,4,6,6-tetramethylcyclohex-1-ene-3,5-dione: Yield 0.25 g (colorless crystals); m.p. > 210°C. 2-(8-fluoroquinolin-5-yl)carbonyl-1,5-di(ethoxycarbonyloxy)-4,4,6,6-tetramethylcyclohex-1-ene-3,5-dione (Compound 3.20)

0.12 g (4 mmol) of sodium hydride was dissolved in 10 ml of tetrahydrofuran, 0.36 g (1 mmol) of 2-[(8-fluoroquinolin-5-yl)carbonyl]-4,4,6,6-tetramethyl-1-hydroxy-cyclohexane-3,5-dione in 5 ml of tetrahydrofuran was 5 added dropwise at room temperature and the mixture was stirred at 40°C for 1 hour. At room temperature, 0.43 g (4 mmol) of ethyl chloroformate were subsequently added dropwise, and the mixture was heated under reflux for 3 hours. After cooling, water was added and the mixture was extracted with ethyl acetate, the 10 organic phase was washed with 2% strength potassium carbonate solution and water and dried and the solvent was removed. This gave 0.45 g of a colorless oil).

15 2-[(8-Chloroquinolin-5-yl)carbonyl]-1-[(dimethylamino)carbonyl-thio]-4,4,6,6-tetramethyl-cyclo-hex-1-ene-3,5-dione (Compound 2.45) and

20 2-[(8-chloroquinolin-5-yl)-[(dimethylamino)carbonylthio]-methylidene]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione (Compound 3.4)

25

0.50 g (1.3 mmol) of 2-[(8-chloroquinolin-5-yl)carbonyl]-4,4,6,6-tetramethyl-cyclohexane-1,3,5-trione was dissolved in 15 ml of tetrahydrofuran, 0.52 g (5.2 mmol) of triethylamine was added and 0.32 g (2.6 mmol) of dimethylaminothiocarbonyl chloride in 5 ml of tetrahydrofuran was added dropwise. The mixture was stirred at room temperature for 30 hours, the solvent was removed, and the residue was taken up in the ethyl acetate, washed with 5% strength potassium carbonate solution and water, dried, concentrated and chromatographed over silica gel using 30 cyclohexane/ethyl acetate. This gave

2-[(8-chloroquinolin-5-yl)carbonyl]-1-[(dimethylamino)carbonyl-thio]-4,4,6,6-tetramethyl-cyclohex-1-ene-3,5-dione: Yield 0.5 g (colorless crystals); m.p. 138°C;

35 2-[(8-chloroquinolin-5-yl)-[(dimethylamino)carbonyl-thio]methylidene]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione: Yield: 0.2 g (colorless crystals) m.p. 75°C.

40 2-[(8-difluoromethylquinolin-5-yl)carbonyl]-1-chloro-4,4,6,6-tetramethyl-cyclohex-1-ene-3,5-dione (Compound 2.31)

Step a) Methyl 8-formyl-5-quinolincarboxylate

45 28.8 g (103 mmol) of 8-(bromomethyl)-5-quinolincarboxylate were dissolved in 200 ml of acetonitrile, 36.1 g (309 mmol) of N-methylmorpholine N-oxide were added, the mixture was stirred at 25°C for 7 hours and the solvent was then removed. Silica gel

chromatography (mobile phase: cyclohexane/ethyl acetate) gave 12.0 g of methyl 8-formyl-5-quinolinecarboxylate (colorless crystals), m.p.: 128°C.

5 Step b) 8-difluoromethyl-5-quinolinecarboxylate

0.5 g (2.3 mmol) of methyl 8-formyl-5-quinolinecarboxylate was dissolved in 50 ml of dichloroethane and, at -20°C, 1.1 g (6.8 mmol) of diethylaminosulfur trifluoride (DAST) were added dropwise. The mixture was stirred at -20°C for 30 min and then warmed to 25°C, and 50 ml of water were added dropwise. The aqueous phase was extracted with methylene chloride, the combined organic phases were washed with sodium bicarbonate solution and dried and the solvent was removed. Yield: 0.7 g of colorless crystals;

¹H-NMR (δ in ppm, d⁶-DMSO): 9.28 (d, 1H); 9.04 (s, 1H); 8.36 (d, 1H); 8.11 (d, 1H); 7.90 (t, 1H); 7.80 (brd s, 1H); 3.96 (s, 3H).

20 Step c) 8-difluoromethyl-5-quinolinecarboxylic acid

0.5 g (2.0 mmol) of methyl 8-difluoromethyl-5-quinolinecarboxylate was dissolved in 5 ml of ethanol, 0.43 g (10.5 mmol) of sodium hydroxide and 1 ml of water were added, and the mixture was stirred at 25°C for 20 hours. The solvents were subsequently removed, the residue was taken up in water, washed twice with methylene chloride and adjusted to pH 1 using 10 N hydrochloric acid, and the precipitate was filtered off with suction. Drying gave 0.5 g of 8-difluoromethyl-5-quinolinecarboxylic acid (colorless crystals);

¹H-NMR (δ in ppm, d⁶-DMSO): 9.35 (d, 1H); 9.04 (s, 1H); 8.38 (d, 1H); 8.10 (d, 1H); 7.92 (t, 1H); 7.78 (brd s, 1H).

35 Step d) 2-[(8-difluoromethylquinolin-5-yl)carbonyl]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione

0.26 g (1.4 mmol) of 2,2,4,4-tetramethylcyclohexane-1,3,5-trione was dissolved in 10 ml of acetonitrile, 0.34 g (1.4 mmol) of 8-difluoromethyl-5-quinolinecarboxylic acid and 0.38 g (1.9 mmol) of dicyclohexylcarbodiimide were added and the mixture was stirred at 25°C for 17 hours. 0.57 g (5.6 mmol) of triethylamine and 5 drops of trimethylsilyl cyanide were then added to the suspension, and stirring was continued at 25°C for a further 25 hours. 50 ml of 5% strength potassium carbonate solution were subsequently added, the mixture was filtered, the filtrate was washed with methyl tert-butyl ether, the aqueous phase was

adjusted to pH 2 using concentrated hydrochloric acid and the precipitate was filtered off, washed with water and dried. Yield: 0.25 g (colorless crystals);

¹H-NMR (δ in ppm, CDCl₃): 17.5 (s, 1H); 9.02 (q, 1H); 8.24 (d, 1H); 8.06 (d, 1H); 7.82 (t, 1H); 7.50 (m, 2H); 1.60 (s, 6H); 1.36 (s, 6H).

Step e) 2-[(8-Difluoromethylquinolin-5-yl)carbonyl]-1-chloro-4,4,6,6-tetramethyl-cyclohex-1-ene-3,5-dione (Compound 10 2.31)

0.25 g (0.65 mmol) of 2-(8-difluoromethylquinolin-5-yl)carbonyl-4,4,6,6-tetramethyl-cyclohexane-1,3,5-trione was dissolved in 15 ml of dichloromethane and 0.25 g (1.95 mmol) of oxalyl chloride and 7 drops of dimethylformamide were added. The mixture was stirred at 25°C for 17 hours, after which the solvent was removed. This gave 0.2 g of colorless crystals.

20 Preparation of the precursor 2-[(8-difluoromethoxyquinolin-5-yl)carbonyl]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione

Step a) Methyl 8-hydroxy-5-quinolincarboxylate

25 16.25 g (86 mmol) of 8-hydroxy-5-quinolincarboxylic acid were dissolved in 70 ml of methanol, 3 ml of concentrated sulfuric acid were added and the mixture was heated under reflux for 25 hours. The solvent was then removed and the residue was taken up in ice-water, adjusted to a pH of 8 using sodium carbonate 30 solution and filtered hot. The residue was extracted with methyl-tert-butyl ether for 7 hours on a jacketed Soxhlet extractor, and the solvent was subsequently removed from the extract. This gave 6.8 g of a brown powder;

¹H-NMR (δ in ppm, d⁶-DMSO): 9.38 (d, 1H); 8.90 (d, 1H); 8.26 (d, 35 1H); 7.71 (dd, 1H); 7.15 (d, 1H); 3.93 (s, 3H).

Step b) Methyl 8-difluoromethoxy-5-quinolincarboxylate

40 1.0 g (5.0 mmol) of methyl 8-hydroxy-5-quinolincarboxylate was dissolved in 20 ml of dimethylformamide, 0.76 g (5.5 mmol) of potassium carbonate was added and 14 g of chlorodifluoromethane were introduced at 40°C over a period of 2 hours. Solid components 45 were then filtered off, the solvent was removed and the residue was washed with water and dried. This gave 0.75 g of a brown powder;

75

¹H-NMR (δ in ppm, CDCl₃): 9.45 (d, 1H); 9.00 (d, 1H); 8.30 (d, 1H); 7.61 (dd, 1H); 7.49 (d, 1H); 7.18 (t, 1H); 3.99 (s, 3H).

Step c) 8-difluoromethoxy-5-quinolinecarboxylic acid

5

0.7 g (2.8 mmol) of methyl 8-difluoromethoxy-5-quinolinecarboxylate was suspended in 15 ml of water and 0.4 g (10 mmol) of sodium hydroxide was added. The mixture was stirred at 25°C for 10 hours and then filtered off, and the filtrate was washed with methyl tert-butyl ether. The aqueous phase was adjusted to pH 3 using concentrated hydrochloric acid and filtered off, and the residue was dried. This gave 0.45 g of a colorless powder; ¹H-NMR (δ in ppm, d₆-DMSO): 13.5 (br, 1H); 9.39 (d, 1H); 9.03 (d, 1H); 8.32 (d, 1H); 7.78 (dd, 1H); 7.62 (d, 1H); 7.60 (t, 1H).

15

Step d) 2-[(8-difluoromethoxyquinolin-5-yl)carbonyl]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione

20 0.4 g (1.7 mmol) of 8-difluoromethoxy-5-quinolinecarboxylic acid was dissolved in 20 ml of acetonitrile, 0.4 g (1.9 mmol) of N,N-dicyclohexylcarbodiimide and 0.3 g (1.7 mmol) of 2,2,4,4-tetramethylcyclohexane-1,3,5-trione were added and the mixture was stirring at 25°C for 20 hours. 0.4 g (4.0 mmol) of triethylamine and 2 drops of trimethylsilyl cyanide were then added, and stirring was continued at 30-35°C for a further 3 hours. The precipitate was filtered off, and the filtrate was concentrated, 20 ml of 5% strength potassium carbonate solution were added and the mixture was washed with methyl tert-butyl ether. The aqueous phase was subsequently adjusted to pH 3 using concentrated hydrochloric acid and extracted with ethyl acetate. The solvent was removed and the residue was chromatographed over silica gel (mobile phase: methylene chloride/methanol). This gave 0.2 g of a colorless powder;

25 35 ¹H-NMR (δ in ppm, CDCl₃): 16.5 (br, 1H); 9.02 (d, 1H); 8.30 (d, 1H); 7.51 (m, 2H); 7.21 (d, 1H); 7.17 (t, 1H); 1.60 (s, 6H); 1.35 (s, 6H).

40 In addition to the cyclohexenone quinolinoyl derivatives of the formula I described above, further derivatives which were prepared or are preparable in a similar manner or in a manner known per se are listed in Tables 2 and 3:

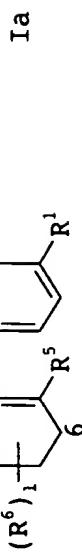


Table 2:

NO.	R ¹	R ²	R ³	R ⁵	(R ⁶) ₁	m.p. [°C] or ¹ H-NMR [ppm]
2.1	F	H	H	OCOC ₆ H ₅	4,4,6,6-(CH ₃) ₄ -5-oxo	178
2.2	F	H	H	OCOC(CH ₃) ₃	4,4,6,6-(CH ₃) ₄ -5-oxo	9.22 (d, 1H); 9.03 (d, 1H); 7.98 (q, 1H); 7.62 (q, 1H); 7.39 (t, 1H); 1.49 (s, 6H); 1.40 (s, 6H); 1.11 (s, 9H)
2.3	C1	H	H	OCOC ₆ H ₅	4,4,6,6-(CH ₃) ₄ -5-oxo	>200
2.4	C1	H	H	OCOC(CH ₃) ₃	4,4,6,6-(CH ₃) ₄ -5-oxo	9.20 (dd, 2H); 8.85 (q, 2H); 7.60 (q, 1H); 1.40 (s, 12H); 1.12 (s, 9H)
2.5	CH ₃	H	H	OPS(OCH ₂ CH ₃) ₂	4,4,6,6-(CH ₃) ₄ -5-oxo	9.50 (d, 1H); 8.98 (d, 1H); 8.06 (d, 1H); 7.60 (m, 2H); 3.95 (m, 4H); 2.90 (s, 3H); 1.65 (s, 6H); 1.51 (s, 6H)
2.6	CH ₃	H	H	OCOSCH ₃	4,4,6,6-(CH ₃) ₄ -5-oxo	128
2.7	CH ₃	H	H	OCSN(CH ₃) ₂	4,4,6,6-(CH ₃) ₄ -5-oxo	163

NO.	R ¹	R ²	R ³	R ⁵	(R ⁶) ₁	m.p. [°C] or ¹ H-NMR [ppm]
2.8	CH ₃	H	H	OCOC ₆ H ₅	4,4,6,6-(CH ₃) ₄ -5-oxo	9.05 (d, 1H); 9.85 (d, 1H); 7.92 (d, 1H); 7.72 (d, 2H); 7.51 (d, 1H); 7.48 (t, 1H); 7.35 (q, 1H); 7.28 (t, 2H); 2.79 (s, 3H); 1.62 (s, 6H); 1.55 (s, 6H)
2.9	CH ₃	H	H	OPO(N(CH ₃) ₂	4,4,6,6-(CH ₃) ₄ -5-oxo	9.41 (d, 1H); 8.95 (d, 1H); 8.07 (d, 1H); 7.58 (d, 1H); 7.50 (q, 1H); 2.88 (s, 3H); 2.45 (s, 6H); 2.42 (s, 6H); 1.65 (s, 6H); 1.48 (s, 6H)
2.10	CH ₃	H	H	OCO(CH ₂) ₃ O(2,4-C ₁₂ -C ₆ H ₃)	4,4,6,6-(CH ₃) ₄ -5-oxo	oil
2.11	CH ₃	H	H	OCOCH(CH ₃)O(2-CH ₃ -4-C ₁ -C ₆ H ₃)	4,4,6,6-(CH ₃) ₄ -5-oxo	oil
2.12	CH ₃	H	H	OCOC(CH ₃) ₃	4,4,6,6-(CH ₃) ₄ -5-oxo	9.20 (d, 1H); 8.85 (d, 1H); 7.80 (d, 1H); 7.51 (d, 1H); 7.48 (q, 1H); 2.85 (s, 3H); 1.55 (s, 6H); 1.50 (s, 6H); 1.08 (s, 9H)
2.13	F	H	H	OCOC(CH ₃) ₃	4,4,6-(CH ₃) ₃	oil
2.14	C1	H	H	OCOCH ₂ CH ₃	4,4,6,6-(CH ₃) ₄ -5-oxo	9.13 (d, 1H); 9.02 (d, 1H); 7.85 (s, 2H); 7.58 (q, 1H); 2.40 (q, 2H); 1.60 (s, 6H); 1.50 (s, 6H); 1.05 (t, 3H)
2.15	F	H	H	OCOSCH ₃	4,4,6,6-(CH ₃) ₄ -5-(OH)	190-192
2.16	C1	H	H	OCOSCH ₃	4,4,6,6-(CH ₃) ₄ -5-oxo	84
2.17	F	H	H	OCOSCH ₃	4,4,6,6-(CH ₃) ₄ -5-oxo	72

No.	R ¹	R ²	R ³	R ⁵	(R ⁶) ₁	m.p. [°C] or ¹ H-NMR [ppm]
2.18	CH ₃	H	H	OCH ₃	4,4,6,6-(CH ₃) ₄ -5-Oxo	9.44 (d, 1H); 9.03 (d, 1H); 7.88 (d, 1H); 7.59 (m, 2H); 3.92 (s, 3H); 2.90 (s, 3H); 1.50 (s, 6H); 1.38 (s, 6H)
2.19	F	H	H	OSO ₂ CH ₃	4,4,6,6-(CH ₃) ₄ -5-(OH)	9.30 (d, 1H); 9.02 (d, 1H); 7.93 (q, 1H); 7.61 (q, 1H); 7.40 (q, 1H); 3.01 (s, 3H); 1.57 (s, 3H); 1.53 (s, 3H); 1.32 (s, 3H); 1.28 (s, 3H)
2.20	F	H	H	OCOOCH ₂ CH ₃	4,4,6,6-(CH ₃) ₄ -5-(OCOOCH ₂ CH ₃)	9.18 (d, 1H); 9.02 (s, 1H); 7.92 (q, 1H); 7.65 (q, 1H); 7.41 (q, 1H); 4.32 (q, 2H); 4.11 (q, 1H); 1.45 (s, 3H); 1.40 (s, 3H); 1.38 (s, 3H); 1.30 (s, 3H); 1.22 (s, 3H); 1.15 (s, 3H)
2.21	F	H	H	OCH ₃	4,4,6,6-(CH ₃) ₄ -5-Oxo	9.45 (d, 1H); 9.03 (d, 1H); 7.96 (q, 1H); 7.68 (q, 1H); 7.40 (t, 1H); 3.88 (s, 3H); 1.50 (s, 6H); 1.39 (s, 6H)
2.22	C1	H	H	C1	4,4,6,6-(CH ₃) ₄ -5-Oxo	180
2.23	F	H	H	C1	4,4,6,6-(CH ₃) ₄ -5-Oxo	152
2.24	C1	H	H	S(4-CH ₃ -C ₆ H ₄)	4,4,6,6-(CH ₃) ₄ -5-Oxo	119
2.25	S(4-CH ₃ -C ₆ H ₄)	H	H	S(4-CH ₃ -C ₆ H ₄)	4,4,6,6-(CH ₃) ₄ -5-Oxo	132-135
2.26	C1	H	H	C1	4,4,6,6-(CH ₃) ₄ -5-Oxo	

NO.	R ¹	R ²	R ³	R ⁵	(R ⁶) ₁	m.p. [°C] or ¹ H-NMR [ppm]
2.27	O(te-trahydronaphthalene-3-yl)	H	H	C1	4,4,6,6-(CH ₃) ₄ -5-oxo	9.65 (d, 1H); 9.05 (d, 1H); 8.83 (d, 1H); 7.66 (q, 1H); 6.95 (d, 1H); 5.23 (m, 1H); 4.21 (d, 2H); 4.05 (m, 2H); 2.39 (m, 2H); 1.62 (s, 6H); 1.48 (s, 6H)
2.28	CH ₃	H	H	C1	4,4,6,6-(CH ₃) ₄ -5-oxo	194
2.29	F	H	H	C1	4,4,6-(CH ₃) ₃	oil
2.30	CH ₃	H	H	Br	4,4,6,6-(CH ₃) ₄ -5-oxo	oil
2.31	CHF ₂	H	H	C1	4,4,6,6-(CH ₃) ₄ -5-oxo	9.40 (d, 1H); 9.05 (d, 1H); 8.05 (d, 1H); 7.86 (t, 1H); 7.80 (d, 1H); 7.65 (q, 1H); 1.59 (s, 6H); 1.48 (s, 6H)
2.32	CF ₃	H	H	C1	4,4,6,6-(CH ₃) ₄ -5-oxo	oil
2.33	CF ₃	CH ₃	H	C1	5,5-(CH ₃) ₂	9.15 (d, 1H); 8.10 (d, 1H); 7.75 (d, 1H); 7.52 (d, 1H); 3.02 (s, 2H); 2.91 (s, 2H); 2.80 (s, 3H); 1.20 (s, 6H)
2.34	CH ₃	H	H	N(CH ₃)OCH ₃	4,4,6,6-(CH ₃) ₄ -5-oxo	oil
2.35	CH ₃	H	H	SC ₂ H ₅	4,4,6,6-(CH ₃) ₄ -5-oxo	9.50 (d, 1H); 9.02 (d, 1H); 7.80 (d, 1H); 7.50 (m, 3H); 2.90 (s, 3H); 2.30 (s, 3H); 1.50 (s, 6H); 1.35 (s, 3H); 1.25 (s, 3H)
2.36	C1	H	H	1-pyrazolyl	4,4,6,6-(CH ₃) ₄ -5-oxo	9.30 (d, 1H); 9.05 (d, 1H); 7.80 (d, 1H); 7.75 (d, 1H); 7.61 (q, 1H); 7.52 (d, 1H); 7.40 (s, 1H); 6.11 (s, 1H); 1.65 (s, 3H); 1.60 (s, 3H); 1.50 (s, 6H)
2.37	C1	H	H	N(CH ₃)OCH ₃	4,4,6,6-(CH ₃) ₄ -5-oxo	190

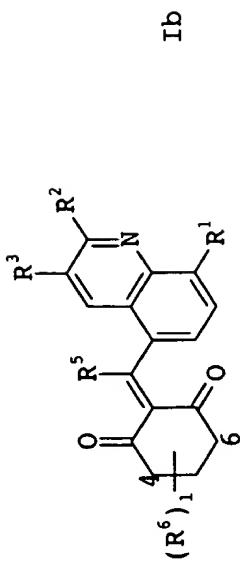
No.	R ¹	R ²	R ³	R ⁵	(R ⁶) ₁	m.p. [°C] or ¹ H-NMR [ppm]
2.38	CH ₃	H	H	1-pyrolidinyl	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	oil
2.39	CH ₃	H	H	4-morpholinyl	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	205
2.40	C1	H	H	4-morpholinyl	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	205
2.41	CH ₃	H	H	C1	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	194
2.42	CH ₃	H	H	1-pyrazolyl	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	150
2.43	CF ₃	H	H	4-morpholinyl	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	oil
2.44	CHNOCH ₃	H	H	C1	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	oil
2.45	C1	H	H	SCON(CH ₃) ₂	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	138
2.46	C1	H	H	4-oxo-1,4-dihydro- pyrid-1-yl	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	>210
2.47	F	H	H	C1	4, 6 - (CH ₃) ₂ -4-SCH ₃	oil
2.48	CH ₃	H	H	SCON(CH ₃) ₂	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	166
2.49	CH ₃	H	H	OP(OCH ₂ CH ₃) ₂	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	9.65 (d, 1H); 8.97 (d, 1H); 7.79 (d, 1H); 7.60 (m, 2H); 4.00 (m, 4H); 2.91 (s, 3H); 1.71 (s, 6H); 1.51 (s, 6H)
2.50	OCH ₃	H	H	C1	4, 4, 6, 6 - (CH ₃) ₄ -5-oxo	9.65 (d, 1H); 9.01 (d, 1H); 7.83 (d, 1H); 7.65 (q, 1H); 7.02 (d, 1H); 4.18 (s, 3H); 1.65 (s, 6H); 1.55 (s, 6H)

No.	R ¹	R ²	R ³	R ⁵	(R ⁶) ₁	m.p. [°C] or ¹ H-NMR [ppm]
2.51	F	H	H	OCOS(CH ₂) ₇ CH ₃	4,4,6,6-(CH ₃) ₄ -5-Oxo	9.20 ((d, 1H); 9.02 (d, 1H); 7.89 (q, 1H); 7.60 (q, 1H); 7.40 (t, 1H); 2.62 (t, 2H); 1.55 (s, 6H); 1.48 (s, 6H); 1.1-1.5 (m, 12H); 0.85 (t, 3H))
2.52	F	H	H	C1	4,6-(ethan-1,2-diy) ¹⁾	9.55 (d, 1H); 9.02 (d, 1H); 7.78 (q, 1H); 7.65 (q, 1H); 7.40 (t, 1H); 3.24 (m, 1H); 3.17 (m, 1H); 2.41 (d, 1H); 1.8-2.4 (m, 5H))
2.53	SCH ₃	H	H	OCOSCH ₃	4,4,6,6-(CH ₃) ₄ -5-Oxo	147
2.54	F	H	H	OCOSCH ₂ CH ₃	4,4,6,6-(CH ₃) ₄ -5-Oxo	107
2.55	Br	H	H	OCOC(CH ₃) ₃	4,4,6,6-(CH ₃) ₄ -5-Oxo	134
2.56	Br	H	H	OCO(C ₆ H ₅)	4,4,6,6-(CH ₃) ₄ -5-Oxo	228
2.57	C1	H	H	F	4,4,6,6-(CH ₃) ₄ -5-Oxo	181
2.58	F	H	H	SO ₂ CH ₃	4,4,6,6-(CH ₃) ₄ -5-Oxo	206
2.59	F	H	H	SOCH ₃	4,4,6,6-(CH ₃) ₄ -5-Oxo	190
2.60	SCH ₂ F	H	H	F	4,4,6,6-(CH ₃) ₄ -5-Oxo	9.50 (d, 1H); 9.00 (d, 1H); 7.81 (s, 2H); 7.65 (q, 1H); 6.01 (d, 2H); 1.60 (s, 6H); 1.51 (s, 6H)
2.61	F	H	H	SC ₆ H ₅	4,4,6,6-(CH ₃) ₄ -5-Oxo	65
2.62	F	H	H	SO ₂ C ₆ H ₅	4,4,6,6-(CH ₃) ₄ -5-Oxo	111
2.63	F	H	H	SCN ₃	4,4,6,6-(CH ₃) ₄ -5-Oxo	143
2.64	CHF ₂	H	H	F	4,4,6,6-(CH ₃) ₄ -5-Oxo	183

No.	R ¹	R ²	R ³	R ⁵	(R ⁶) ₁	m.p. [°C] or ¹ H-NMR [ppm]
2.65	C1	CHF ₂	H	F	4,4',6,6-(CH ₃) ₄ -5-OXO	173
2.66	F	H	H	F	4,4',6,6-(CH ₃) ₄ -5-OXO	153

1) R⁴ = 4-Oxo-(bicyclo[3.2.1]oct-2-en-3-yl)carbonyl

Table 3:



No.	R ¹	R ²	R ³	R ⁵	R ⁶	m.p. [°C] or ¹ H-NMR [ppm]
3.1	C1	H	H	C1	4,4,6,6-(CH ₃) ₄ -5-oxo	156
3.2	CH ₃	H	H	1-(1,2,4-triazo-1-yl)	4,4,6,6-(CH ₃) ₄ -5-oxo	9.00 (d, 1H); 8.09 (s, 1H); 7.82 (d, 1H); 7.72 (s, 1H); 7.68 (d, 1H); 7.47 (d, 1H); 7.35 (q, 1H); 2.95 (s, 3H); 1.55 (s, 6H); 1.30 (s, 6H)
3.3	C1	H	H	4-morpholinyl	4,4,6,6-(CH ₃) ₄ -5-oxo	9.15 (d, 1H); 8.32 (d, 1H); 7.82 (d, 1H); 7.60 (q, 1H); 7.45 (d, 1H); 4.05 (m, 2H); 3.68 (m, 4H); 3.35 (m, 1H); 3.25 (m, 1H); 1.30 (s, 6H); 1.22 (s, 6H)
3.4	C1	H	H	SCON(CH ₃) ₂	4,4,6,6-(CH ₃) ₄ -5-oxo	75
3.5	C1	H	H	4-oxo-1,4-dihydro- pyrid-1-yl	4,4,6,6-(CH ₃) ₄ -5-oxo	9.02 (d, 1H); 8.42 (d, 1H); 7.80 (2d, 3H); 7.50 (q, 1H); 7.38 (d, 1H); 6.72 (d, 2H); 1.50 (s, 12H)
3.6	C1	H	H	N(CH ₃) ₂	4,4,6,6-(CH ₃) ₄ -5-oxo	190

The compounds of the formula I and their agriculturally useful salts are suitable, both in the form of isomer mixtures and in the form of the pure isomers, as herbicides. The herbicidal 5 compositions comprising compounds of the formula I control vegetation on non-crop areas very efficiently, especially at high rates of application. They act against broad-leaved weeds and harmful grasses in crops such as wheat, rice, maize, soya and cotton without causing any significant damage to the crop plants. 10 This effect is mainly observed at low rates of application.

Depending on the application method used, the compounds of the formula I, or the compositions comprising them, can additionally be employed in a further number of crop plants for eliminating 15 undesirable plants. Examples of suitable crops are the following:

Allium cepa, Ananas comosus, Arachis hypogaea, Asparagus officinalis, Beta vulgaris spec. altissima, Beta vulgaris spec. rapa, Brassica napus var. napus, Brassica napus var. 20 napobrassica, Brassica rapa var. silvestris, Camellia sinensis, Carthamus tinctorius, Carya illinoinensis, Citrus limon, Citrus sinensis, Coffea arabica (Coffea canephora, Coffea liberica), Cucumis sativus, Cynodon dactylon, Daucus carota, Elaeis guineensis, Fragaria vesca, Glycine max, Gossypium hirsutum, 25 (Gossypium arboreum, Gossypium herbaceum, Gossypium vitifolium), Helianthus annuus, Hevea brasiliensis, Hordeum vulgare, Humulus lupulus, Ipomoea batatas, Juglans regia, Lens culinaris, Linum usitatissimum, Lycopersicon lycopersicum, Malus spec., Manihot esculenta, Medicago sativa, Musa spec., Nicotiana tabacum 30 (N.rustica), Olea europaea, Oryza sativa, Phaseolus lunatus, Phaseolus vulgaris, Picea abies, Pinus spec., Pisum sativum, Prunus avium, Prunus persica, Pyrus communis, Ribes sylvestre, Ricinus communis, Saccharum officinarum, Secale cereale, Solanum tuberosum, Sorghum bicolor (s. vulgare), Theobroma cacao, 35 Trifolium pratense, Triticum aestivum, Triticum durum, Vicia faba, Vitis vinifera and Zea mays.

In addition, the compounds of the formula I may also be used in crops which tolerate the action of herbicides owing to breeding, 40 including genetic engineering methods.

The compounds of the formula I, or the herbicidal compositions comprising them, can be used for example in the form of ready-to-spray aqueous solutions, powders, suspensions, also 45 highly-concentrated aqueous, oily or other suspensions or dispersions, emulsions, oil dispersions, pastes, dusts, materials for broadcasting or granules, by means of spraying, atomizing,

dusting, broadcasting or watering. The use forms depend on the intended aims; in any case, they should guarantee a very fine distribution of the active compounds according to the invention.

5 The herbicidal compositions comprise a herbicidally effective amount of at least one compound of the formula I or of an agriculturally useful salt of I, and auxiliaries which are customary for the formulation of crop protection agents.

10 Essentially, suitable inert auxiliaries include: mineral oil fractions of medium to high boiling point, such as kerosene and diesel oil, furthermore coal tar oils and oils of vegetable or animal origin, aliphatic, cyclic and aromatic hydrocarbons, e.g. paraffin, tetrahydronaphthalene, alkylated 15 naphthalenes and their derivatives, alkylated benzenes and their derivatives, alcohols such as methanol, ethanol, propanol, butanol and cyclohexanol, ketones such as cyclohexanone, or strongly polar solvents, e.g. amines such as N-methylpyrrolidone, and water.

20 Aqueous use forms can be prepared from emulsion concentrates, suspensions, pastes, wettable powders or water-dispersible granules by adding water. To prepare emulsions, pastes or oil dispersions, the cyclohexenonequinolinoyl derivatives of the 25 formula I, either as such or dissolved in an oil or solvent, can be homogenized in water by means of a wetting agent, tackifier, dispersant or emulsifier. Alternatively, it is possible to prepare concentrates comprising active substance, wetting agent, tackifier, dispersant or emulsifier and, if desired, solvent or 30 oil, which are suitable for dilution with water.

Suitable surfactants are the alkali metal salts, alkaline earth metal salts and ammonium salts of aromatic sulfonic acids, e.g. ligno-, phenol-, naphthalene- and dibutylnaphthalenesulfonic 35 acid, and of fatty acids, alkyl- and alkylarylsulfonates, alkyl sulfates, lauryl ether sulfates and fatty alcohol sulfates, and salts of sulfated hexa-, hepta- and octadecanols, and also of fatty alcohol glycol ethers, condensates of sulfonated naphthalene and its derivatives with formaldehyde, condensates of 40 naphthalene, or of the naphthalenesulfonic acids with phenol and formaldehyde, polyoxyethylene octylphenol ether, ethoxylated isooctyl-, octyl- or nonylphenol, alkylphenyl or tributylphenyl polyglycol ether, alkylaryl polyether alcohols, isotridecyl alcohol, fatty alcohol/ethylene oxide condensates, ethoxylated 45 castor oil, polyoxyethylene alkyl ethers or polyoxypropylene alkyl ethers, lauryl alcohol polyglycol ether acetate, sorbitol esters, lignin-sulfite waste liquors or methylcellulose.

Powders, materials for broadcasting and dusts can be prepared by mixing or grinding the active substances together with a solid carrier.

5 Granules, e.g. coated granules, impregnated granules and homogeneous granules, can be prepared by binding the active compounds to solid carriers. Solid carriers are mineral earths, such as silicas, silica gels, silicates, talc, kaolin, limestone, lime, chalk, bole, loess, clay, dolomite, diatomaceous earth, 10 calcium sulfate, magnesium sulfate, magnesium oxide, ground synthetic materials, fertilizers such as ammonium sulfate, ammonium phosphate and ammonium nitrate, ureas, and products of vegetable origin, such as cereal meal, tree bark meal, wood meal and nutshell meal, cellulose powders, or other solid carriers.

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The concentrations of the compounds of the formula I in the ready-to-use preparations can be varied within wide ranges. In general, the formulations comprise from about 0.001 to 98% by weight, preferably 0.01 to 95% by weight of at least one active 20 compound. The active compounds are employed in a purity of from 90% to 100%, preferably 95% to 100% (according to the NMR spectrum).

The following formulation examples illustrate the production of 25 such preparations:

I. 20 parts by weight of the compound No. 2.2 are dissolved in a mixture composed of 80 parts by weight of alkylated benzene, 10 parts by weight of the adduct of 8 to 10 mol of ethylene oxide to 1 mol of oleic acid N-monoethanolamide, 5 parts by weight of calcium dodecylbenzenesulfonate and 5 parts by weight of the adduct of 40 mol of ethylene oxide to 1 mol of castor oil. Pouring the solution into 100,000 parts by weight of water and finely distributing it therein gives an aqueous dispersion which comprises 0.02% by weight of the active compound.

II. 20 parts by weight of the compound No. 2.4 are dissolved in a mixture composed of 40 parts by weight of cyclohexanone, 40 parts by weight of isobutanol, 20 parts by weight of the adduct of 7 mol of ethylene oxide to 1 mol of isooctylphenol and 10 parts by weight of the adduct of 40 mol of ethylene oxide to 1 mol of castor oil. Pouring the solution into 100,000 parts by weight of water and finely distributing it therein gives an aqueous dispersion which comprises 0.02% by weight of the active compound.

EPO-49365-2297

III. 20 parts by weight of the compound No. 2.16 are dissolved in a mixture composed of 25 parts by weight of cyclohexanone, 65 parts by weight of a mineral oil fraction of boiling point 210 to 280°C and 10 parts by weight of the adduct of 40 mol of ethylene oxide to 1 mol of castor oil. Pouring the solution into 100,000 parts by weight of water and finely distributing it therein gives an aqueous dispersion which comprises 0.02% by weight of the active compound.

IV. 20 parts by weight of the compound No. 2.18 are mixed thoroughly with 3 parts by weight of sodium diisobutylnaphthalenesulfonate, 17 parts by weight of the sodium salt of a lignosulfonic acid from a sulfite waste liquor and 60 parts by weight of pulverulent silica gel, and the mixture is ground in a hammer mill. Finely distributing the mixture in 20,000 parts by weight of water gives a spray mixture which comprises 0.1% by weight of the active compound.

V. 3 parts by weight of the compound No. 2.22 are mixed with 97 parts by weight of finely divided kaolin. This gives a dust which comprises 3% by weight of the active compound.

VI. 20 parts by weight of the compound No. 2.46 are mixed intimately with 2 parts by weight of the calcium salt of dodecylbenzenesulfonate, 8 parts by weight of fatty alcohol polyglycol ether, 2 parts by weight of the sodium salt of a phenol/urea/formaldehyde condensate and 68 parts by weight of a paraffinic mineral oil. This gives a stable oily dispersion.

VII. 1 part by weight of the compound No. 3.1 is dissolved in a mixture composed of 70 parts by weight of cyclohexanone, 20 parts by weight of ethoxylated isoctylphenol and 10 parts by weight of ethoxylated castor oil. This gives a stable emulsion concentrate.

VIII. 1 part by weight of the compound No. 3.4 is dissolved in a mixture composed of 80 parts by weight of cyclohexanone and 20 parts by weight of Wettol® EM 31 (nonionic emulsifier based on ethoxylated castor oil). This gives a stable emulsion concentrate.

The compounds of the formula I or the herbicidal compositions can be applied pre- or post-emergence. If the active compounds are less well tolerated by certain crop plants, application

techniques may be used in which the herbicidal compositions are sprayed, with the aid of the spraying equipment, in such a way that they come into contact as little as possible, if at all, with the leaves of the sensitive crop plants, while the active 5 compounds reach the leaves of undesirable plants growing underneath, or the bare soil surface (post-directed, lay-by).

The application rates of the compound of the formula I are from 0.001 to 3.0, preferably 0.01 to 1.0 kg/ha of active substance 10 (a.s.), depending on the control target, the season, the target plants and the growth stage.

To widen the activity spectrum and to achieve synergistic effects, the cyclohexenonequinolinoyl derivatives of the formula 15 I may be mixed with a large number of representatives of other herbicidal or growth-regulating active compound groups and then applied concomitantly. Suitable components for mixtures are, for example, 1,2,4-thiadiazoles, 1,3,4-thiadiazoles, amides, aminophosphoric acid and its derivatives, aminotriazoles, 20 anilides, (het)aryloxyalkanoic acids and their derivatives, benzoic acid and its derivatives, benzothiadiazinones, 2-aryl-1,3-cyclohexanediones, hetaryl aryl ketones, benzylisoxazolidinones, meta-CF₃-phenyl derivatives, carbamates, quinolinecarboxylic acid and its derivatives, chloroacetanilides, 25 cyclohexenone oxime ether derivatives, diazines, dichloropropionic acid and its derivatives, dihydrobenzofurans, dihydrofuran- 3-ones, dinitroanilines, dinitrophenols, diphenyl ethers, dipyridyls, halocarboxylic acids and their derivatives, ureas, 3-phenyluracils, imidazoles, imidazolinones, N-phenyl- 30 3,4,5,6-tetrahydraphthalimides, oxadiazoles, oxiranes, phenols, aryloxy- and hetaryl oxyphenoxypropionic esters, phenylacetic acid and its derivatives, phenylpropionic acid and its derivatives, pyrazoles, phenylpyrazoles, pyridazines, pyridinecarboxylic acid and its derivatives, pyrimidyl ethers, sulfonamides, 35 sulfonylureas, triazines, triazinones, triazolinones, triazolecarboxamides and uracils.

It may furthermore be advantageous to apply the compounds of the formula I, alone or else concomitantly in combination with other 40 herbicides, in the form of a mixture with other crop protection agents, for example together with agents for controlling pests or phytopathogenic fungi or bacteria. Also of interest is the miscibility with mineral salt solutions, which are employed for treating nutritional and trace element deficiencies.
45 Non-phytotoxic oils and oil concentrates may also be added.

Use Examples

The herbicidal activity of the cyclohexenonequinolinoyl derivatives of the formula I was demonstrated by the following 5 greenhouse experiments:

The culture containers used were plastic pots containing loamy sand with approximately 3.0% of humus as the substrate. The seeds of the test plants were sown separately for each species.

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For the pre-emergence treatment, the active compounds, which had been suspended or emulsified in water, were applied directly after sowing by means of finely distributing nozzles. The containers were irrigated gently to promote germination and 15 growth and subsequently covered with transparent plastic hoods until the plants had rooted. This cover caused uniform germination of the test plants, unless this was adversely affected by the active compounds.

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For the post-emergence treatment, the test plants were first grown to a height of 3 to 15 cm, depending on the plant habit, and only then treated with the active compounds which had been suspended or emulsified in water. The test plants were for this purpose either sown directly and grown in the same containers, or 25 they were first grown separately as seedlings and transplanted into the test containers a few days prior to treatment. The application rate for the post-emergence treatment was 0.25 or 0.125 kg of a.s. (active substance)/ha.

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Depending on the species, the plants were kept at 10 - 25°C or 20 - 35°C. The test period extended over 2 to 4 weeks. During this time, the plants were tended, and their response to the individual treatments was evaluated.

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The evaluation was carried out using a scale from 0 to 100. 100 means no emergence of the plants, or complete destruction of at least the aerial parts and 0 means no damage, or normal course of growth.

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The plants used in the greenhouse experiments are composed of the following species:

Scientific Name	Common Name
<i>Abutilon theophrasti</i>	velvet leaf
5 <i>Chenopodium album</i>	lambsquarters
<i>Galium aparine</i>	catchweed bedstraw
<i>Ipomoea spp.</i>	morning glory
10 <i>Setaria faberi</i>	giant foxtail
<i>Setaria viridis</i>	green foxtail
<i>Solanum nigrum</i>	black nightshade

15 At application rates of 0.25 and 0.125 kg of a.s./ha, the compounds 2.2, 2.4 and 2.16, applied post-emergence, showed very good activity against harmful plants such as giant foxtail, green foxtail and black nightshade. Furthermore, the compounds 2.2 and 2.4 controlled velvet leaf and morning glory very efficiently.

20 Compound 2.16 additionally showed excellent activity against the weeds lambsquarters and catchweed bedstraw.

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